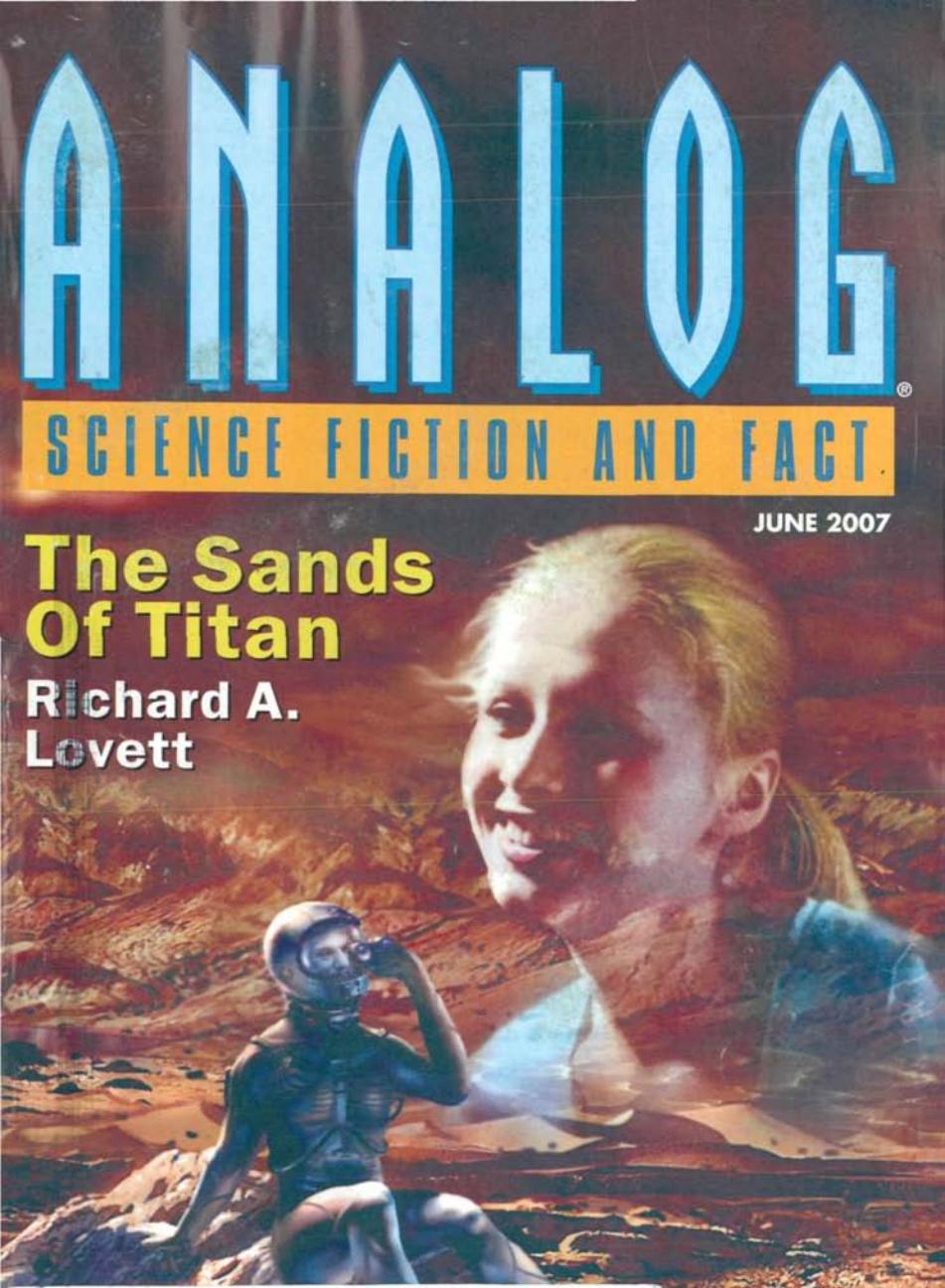
ANALOG

SCIENCE FICTION AND FACT

JUNE 2007

The Sands Of Titan

Richard A. Lovett



11 1 ********AUTO**3-DIGIT 020
AFF 04/01/09 6603184 1
WILLIAM F ROBERTS
93 HIGH ST
NORWELL, MA 02061-1838

har Vajra

chroeder

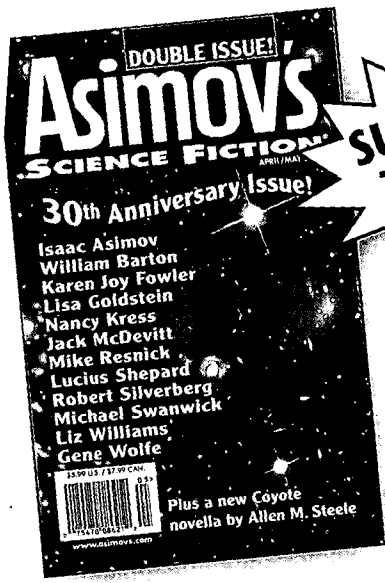
www.analogsf.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

scinating articles, ...
ience fact. 1 year (12 issues*), just $32.97!

Visit **www.analogsf.com** →

SUBSCRIBE TODAY!



Asimov's Science Fiction
Novellas and short stories from the leading science fiction and fantasy writers. Plus, candid, no-holds-barred book reviews and guest editorials.
1 year (12 issues*), just $32.97!

← Visit **www.asimovs.com**

To order by charge card, call
TOLL-FREE: 1-800-220-7443 (8am - 7pm EST)

or mail your name, address, order, and payment to:

Dell Magazines Direct
6 Prowitt St., Suite S • Norwalk, CT 06855-1220

Please allow 4 to 6 weeks for delivery of your first issue. **Outside U.S.A.:** Add $10 per year for shipping and handling (U.S. funds). **WA residents:** Add state and local taxes to your total order. *We publish double issues twice a year which count as four issues toward your subscription.

47C-NSFSLL

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

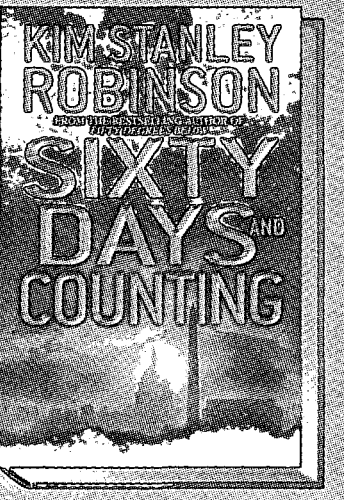
New from Hugo, Nebula, and Locus Award-winning author

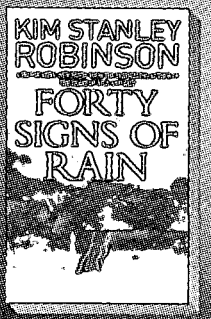
KIM STANLEY ROBINSON

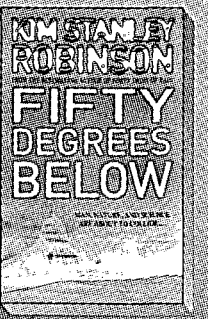
"There is no finer writer of science fiction today."
—*The New York Times Book Review*

In the thrilling conclusion to his acclaimed trilogy of near-future eco-thrillers, Kim Stanley Robinson explores what may happen if we close our eyes to the dangerous signs of global warming.

It began with torrential rain and continued with sub-zero temperatures. Now, as Washington, D.C. succumbs to more erratic winter weather patterns, the president-elect puts into play an ambitious—and perhaps miraculous—plan to save the world from ultimate doom.







Don't miss the first two novels in the series, both available in paperback.

Visit www.bantamdell.com to sign up for Spectra Pulse, our free eNewsletter.

SPECTRA

Wherever books are sold • eBook editions also available

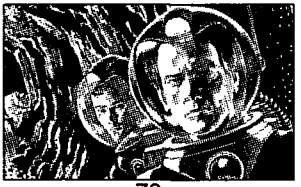
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ANALOG®

SCIENCE FICTION AND FACT

Vol. CXXVII No. 6
June 2007

Next Issue on Sale
May 15, 2007



78

10

SERIAL

QUEEN OF CANDESCE, conclusion, Karl Schroeder ____ 94

NOVELLA

THE SANDS OF TITAN, Richard A. Lovett ____ 10

NOVELETTE

ON THE BUBBLE, Rajnar Vajra ____ 60

SHORT STORIES

FATHER HAGERMAN'S DOG, Scott William Carter ____ 54
A ZOO IN THE JUNGLE, Carl Frederick ____ 78

SCIENCE FACT

CRYOVOLCANOES, SWISS CHEESE,
AND THE WALNUT MOON, Richard A. Lovett ____ 40

PROBABILITY ZERO

VECTORING, Geoffrey A. Landis ____ 92

READER'S DEPARTMENTS

THE EDITOR'S PAGE ____ 4
IN TIMES TO COME ____ 133
THE ALTERNATE VIEW, Jeffery D. Kooistra ____ 89
THE REFERENCE LIBRARY, Tom Easton ____ 134
BRASS TACKS ____ 140
UPCOMING EVENTS, Anthony Lewis ____ 144

Stanley Schmidt Editor — **Trevor Quachri** Managing Editor

Cover design by Victoria Green — Cover Art by David A. Hardy

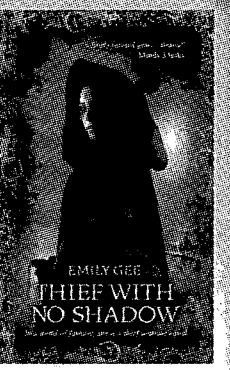
Indicia on Page 5

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

AVAILABLE NOW

"A finely faceted gem"

Mindy Klasky, author of
The Glasswright's Apprentice



THIEF WITH NO SHADOW

Emily Gee

978-1-84416-469-1
$7.99 US / $9.99 CAN

Aided by the magic which courses through her veins, the wraith girl, Melke, must steal back a valuable heirloom from a monster's den or condemn her brother to death, in this rich, romantic fantasy.

SOLARIS
SCIENCE FICTION/FANTASY/DARK FANTASY

For more information and free first chapters visit
WWW.SOLARISBOOKS.COM

LICENSED TO UN2.ORG
ELECTRONIC REPRODUCTION PROHIBITED

EDITORIAL Stanley Schmidt

FOGGY BORDERLANDS

"Just because there's twilight," as Kelvin Throop observed, "doesn't mean you can't tell the difference between night and day."

He was speaking figuratively, about the perennial debate over what is and isn't science fiction. Certainly science fiction has something in common with several other fields, notably fantasy and alternate history. Sometimes a story can be *both* science fiction and something else, such as alternate history or mystery. And sometimes a case can be made for considering a story *either* science fiction or something else, enough so that intelligent people can disagree and argue at length about which classification is more appropriate.

But there are also plenty of cases that, by reasonably well-defined criteria, are clearly one or the other. The recent tendency of some publishers, marketers, critics, and even readers to treat all of these kinds of stories as one big fuzzy catch-all, more or less equivalent, is simply wrong. They act as if the whole literary landscape were blurred into one fog-blanketed whole (if I may mix metaphors), whereas really only the borders are hazy.

Why does it matter? Because some readers care about the differences—and this does not necessarily imply that they view one field as Absolutely The Best and look haughtily down on all the others. Some do, of course; but there are plenty of readers who like well-done science fiction *and* fantasy *and* alternate history . . .

. . . but like to know which one they're getting into at any given time. If I have a taste for steak tonight, fish stew may not satisfy, even if I would think it wonderful at another time. Somebody buying a ticket to a baseball game expects to see a baseball game, and has a legitimate gripe if he gets into the stadium and finds it full of people playing football instead.

And the players certainly need to know which kind of gear to wear and which rules to follow. Which leads us to another reason for trying to blow some of the haze away and clarify just where those borders are: writers need to know what kinds of materials they are most likely to be able to sell, and who is most likely to buy them.

That last part is important because not everyone draws the borders the same way. As I've already mentioned, many people now apply the term "science fiction" quite loosely to a wide range of things ranging from fantasy to alternate history to things barely distinguishable from mainstream. *Analog* is famous (or notorious, depending on who you talk to) for defining it a good deal more stringently.

But how much more stringently? Not as much so as some assume, when readers don't read us or writers don't submit to us because they mistakenly believe that all we publish is nuts-and-bolts technical-problem stories focusing only on hardware. The actual range of what we publish is, as regular readers know, far

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

broader than that. On the other hand, it's not *infinitely* broad. There are stories that simply would not go over with most of our readers if they found them here, even if they might like to read them elsewhere.

So what *are* the limits? I thought it might be worthwhile to spend a few pages trying to clarify them, at least a little, because I'd like to get as many readers as possible who might like what we're doing, and I don't want writers sending good *Analog* stories elsewhere because they think our limits are narrower than they are. Neither do I want to attract readers under false pretenses, or encourage writers to waste postage on stories that are clearly not right for us. (But if you're a writer and you have the slightest doubt about whether we'd be interested, please let me decide!)

I can't give you an exact, infallible prescription that says if you do this it will work for us and if you do that it won't. Much about writing is subjective, and once in a great while I'll get a story that seems to break all the "rules," but does it so dazzlingly that my gut feeling is that the readers will love it anyway. In such a case, I'll go with the gut (and usually it's right). Genuine brilliance can overcome a lot of preconceptions. So can brevity and/or humor (remember what Shakespeare said about those?). You can get away with risky things more easily in a short story than in a long one, and readers will swallow things in an unabashedly facetious tale that they wouldn't in one that purports to be serious.

But few of us can count on being truly brilliant or briefly witty every time we try, so if you're trying to sell stories to our readers (and do remember that they're the customers; I'm just the go-between), your chances are best if you have a clear understanding of what the guidelines usually are.

And those are quite simple. In general, I expect *Analog* science fiction to do two things:

1. It should incorporate some element of scientific or technological speculation in a way that is *integral* to the story.

2. It should make a reasonable effort to make the speculative science *plausible* in the light of what we now (think we) know about science.

And that's all, except for the basic requirements common to any kind of fiction, such as creating characters who engage a reader's attention and sympathy and whose efforts to solve meaningful problems make for a rewarding reading experience.

Please note carefully that neither of my two special requirements implies that our stories need to be exclusively or primarily about technical details, or to be full of technical jargon. Daniel Keyes's classic "Flowers for Algernon," for example, is first and foremost a hauntingly memorable *people* story, with hardly any technological gimmickry or jargon, yet it's a perfect illustration

Analog Science Fiction and Fact (Astounding), Vol. CXXVII, No. 6, June 2007. ISSN 1059-2113, USPS 488-910, GST# 123054108. Published monthly except for combined January/February and July/August double issues by Dell Magazines, a division of Crosstown Publications. One-year subscription for $43.90 in the U.S.A. and possessions, in all other countries, $53.90 (GST included in Canada) payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Periodical postage paid at Norwalk, CT and additional mailing offices. Canadian postage paid at Montreal, Quebec. Canada Post International Publications Mail. © 2007 by Dell Magazines, a division of Crosstown Publications, all rights reserved. Dell is a trademark registered in the U.S. Patent Office. Protection secured under the Universal Copyright Convention. Reproduction or use of editorial or pictorial content in any manner without express permission is prohibited. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. All submissions must be accompanied by stamped self-addressed envelope, the publisher assumes no responsibility for unsolicited manuscripts or artwork.

POSTMASTER: Send change of address to: ANALOG SCIENCE FICTION AND FACT
6 Prowitt Street, Norwalk, CT 06855.

IN CANADA RETURN TO: Quebecor St. Jean, 800 Blvd. Industrial, St. Jean, Quebec J3B 8G4
Executive Office: Penny Press, 6 Prowitt St., Norwalk, CT 06855
Editorial and Advertising: Analog Science Fiction and Fact, 475 Park Avenue South, New York, N.Y. 10016
Subscriptions: Analog Science Fiction and Fact, 6 Prowitt Street, Norwalk, CT 06855.

Printed in Canada

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of my first requirement. Everything that happens to Charlie Gordon grows directly out of his intelligence-raising operation; take that out, and the whole story collapses. The *Star Wars* movies, on the other hand, don't meet that test at all, though they're chock-full of "science-fictional" elements like rockets, robots, and aliens. They're lots of fun, but they're essentially recast mythology—or, as my father puts it, "westerns with terrific special effects."

And "The Force" leads us naturally to my second "rule": the stories are so vague about what it is and how it works that it comes across as more mystical than scientific. There's no real way to judge how plausible it is. In the matter of plausibility, science fiction (in the *Analog* sense) can often be viewed as using one of two types of speculation. *Extrapolation* is in some respects the simpler and in other respects the more difficult. It means taking principles that are already well established and working out something new that can be done with them. Many stories in which space travel figures prominently are of this type: orbital mechanics and rocketry are understood in such detail that writers can figure out in great detail new things that could be done with them, as Donald Kingsbury and Roger Arnold did for Kingsbury's "The Moon Goddess and the Son" (December 1979). It's "easy" because the relevant data and equations already exist; it's hard because the readers insist that you use them—and get it right.

Some would like to see science fiction restrict itself exclusively to extrapolation, exploring the consequences only of things we already know are possible—but that would make for a seriously unrealistic body of fiction. We also need the other main kind of speculation, which I call *innovation*: postulating kinds of science that haven't been discovered up to now, but conceivably could be in the future, like antigravity, faster-than-light travel, or time travel. Most of the ones we can imagine will never happen, but something approximating some of them may, so it can be worthwhile—and fun—to explore the possible consequences if they do. As evidence that such surprises can and do happen, consider the fact that relativity and quantum mechanics would have been in this category little more than a century ago.

At first glance it might seem that inno-

STANLEY SCHMIDT .....Editor
TREVOR QUACHRI.....Managing Editor
MARY GRANT.....Editorial Assistant
VICTORIA GREEN.....Senior Art Director
IRENE LEE.....Production Artist/Graphic Designer
CAROLE DIXON.....Senior Production Manager
EVIRA MATOS.....Production Associate
ABIGAIL BROWNING.....Manager, Subsidiary Rights and Marketing
JULIA McEVOY.....Manager, Advertising Sales
BRUCE W. SHERBOW.....VP, Sales and Marketing
SANDY MARLOWE.....Circulation Services

PETER KANTER
Publisher

CHRISTINE BEGLEY
Associate Publisher

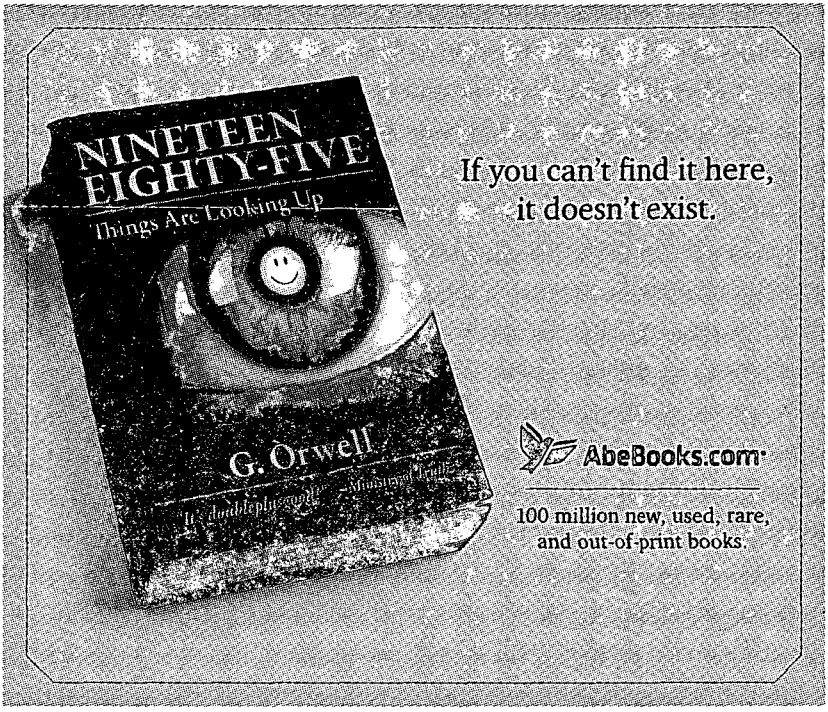
SUSAN KENDRIOSKI
Executive Director, Art & Production

Published since 1930

First issue of *Astounding* January 1930 ©

ADVERTISING REPRESENTATIVE Connie Goon, Advertising Sales Coordinator,
Tel:(212) 686-7188 ■ Fax:(212) 686-7414 (Display and Classified Advertising)
EDITORIAL CORRESPONDENCE ONLY analog@dellmagazines.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED


NINETEEN EIGHTY-FIVE
Things Are Looking Up
G. Orwell
If you can't find it here, it doesn't exist.
AbeBooks.com
100 million new, used, rare, and out-of-print books.

vation is easier than extrapolation because you can make up your own rules, but that's not quite true. You have to make them up in such a way that they don't contradict the old rules in regions of experience already well tested, just as relativity and quantum mechanics become indistinguishable from Newtonian mechanics under the special conditions of everyday life. And you have to think out their logical consequences well enough to keep what happens in your story consistent with them. (For more about these matters, see my editorials "Magic" [September 1993] and "Bold and Timid Prophets" [November 1995].)

So much for the ground rules: the basic principles that, if they are satisfied, assure you that you are clearly within the frontiers of "*Analog* science fiction." But what about those foggy borderlands? Let's look at a few examples (some real and specific, some general and hypothetical) of stories lying Out There, either pushing the boundary or lying beyond it—and how I decided which way to classify them.

It's often said that fantasy is as far from *Analog* as it can get, but remember that *Unknown*, that wonderfully quirky fantasy magazine of the late 1930s and early 1940s, was a direct spin-off of *Astounding* (as *Analog* was then called) and edited by the same John W. Campbell. Even in my tenure we have published enough stories dealing with classical fantasy themes that I may someday put together an anthology of them (called *Fantasy With Rivets*?). "Murphy," by Stephen L. Kallis, Jr. (April 1983), was a short story about the technologically unemployed leprechaun who invented the profession of gremlin. In Charles L. Harness's "H-Tec" (May 1981), Hell was being used as the high-temperature reservoir of a heat engine (and was in danger of freezing over if this went on). Timothy Zahn's "The

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

President's Doll" (July 1987) combined acupuncture (a real technology that works even though we don't yet understand exactly how) with voodoo.

How did these authors get away with it? In each case the author made one clearly fantastic assumption, but then extrapolated from that with the attitude of a perfectly competent engineer using ordinary logic in a context of real science. In each case the author's tongue was clearly in cheek; he made no secret of the fact that he was implicitly asking you to play along, just for a little while, with something that you would normally consider too far-fetched. And each story (with the arguable exception of "H-Tec," a moderate-sized novelette) was *short*, because people can suspend their disbelief (just as they can hold their breath) more easily for a short time than a long one.

An apparent exception from a little before my time was a very famous novel (now grown into an extensive series) often mistakenly thought of as flat-out fantasy: Anne McCaffrey's *Dragonflight*, which started out in *Analog* as the novella "Weyr Search" and the serial *Dragonrider*. Presumably people think of these stories as fantasy because of the dragons, but these are not the simple dragons of Earthly mythology. They have even more remarkable powers, dependent on principles that we don't know but are applied quite consistently. Those principles aren't explained, and neither are the Threads that periodically menace Pern, because none of the characters is in a position to do so; but there are enough fragmentary remnants of old investigations of the Threads to tell a knowledgeable reader that McCaffrey did her homework and knew exactly what she was talking about.

We seldom publish alternate history in its purest form—that is, a story that simply shows how some portion of Earth's history might have gone differently—without linking it to our own version by some such interaction as time travel or contact between the "branch universes" of the many-worlds interpretation of quantum mechanics. And yet we did publish, proudly, Harry Turtledove's "sims" series (beginning in 1985 and later published as *A Different Flesh*), in which not *Homo sapiens* but *Homo erectus* crossed the Bering Land Bridge to become the "Native Americans" waiting when the first Europeans got here a few hundred years ago.

A few of our stories have been fairly close to "mainstream," though in one case, ironically, such a story was mistaken by at least one reader for something entirely different. When we published Thomas R. Dulski's "The Case of the Gring's Mill Goblin" (December 1985), I got an irate letter from a reader protesting our decision to publish "fantasy." It turned out he hadn't read the story, but simply jumped to a conclusion from the title. In fact, the story was rigorously dependent on chemistry so close to what we already know that I would have been less surprised by a complaint that it wasn't speculative enough.

We did get a few such complaints about Maya Kaathryn Bohnhoff's first story here, "Hand-Me-Down Town" (Mid-December 1989). It's true that it was essentially contemporary and involved no new technology or scientific principles—but it did involve what amounted to a sociological experiment, a kind of social organization that to our knowledge had never been tried and might help solve some of our real problems. Sociology isn't (at least so far) a rigorous science in the sense that physics or even biology is, but finding new ways to make civilization work is certainly one of the prime occupations of science fiction (and most readers agreed).

Finally, how about some examples that are beyond the foggy zone and clearly beyond the line—stories that, no matter how well crafted they are or how much I might personally like them, I couldn't use in *Analog* because most

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

readers wouldn't accept them as science fiction? Here I will not name names, because I wouldn't want to embarrass anybody; but I can give descriptions. And don't be surprised if you see stories fitting those descriptions elsewhere, because some have been written that richly deserve publication and will find it elsewhere.

I regularly see, for example, stories in which computers carry out wish fulfillment or punitive functions indistinguishable from those of a fairy godmother, a genie in a bottle, or a wicked witch. The mere presence or even prominence of technology does not make a story science fiction. If you show the hardware doing something far beyond what we have any reason to suppose it can do, and you provide no basis for supposing that it can, then the story is fantasy, pure and simple, and our readers won't buy it.

If your characters fly about in spaceships and fight with lasers, but interact in the same ways as nineteenth-century cowboys on horseback or pirates on sailing ships, then your story isn't science fiction—it's mainstream in a transparent disguise and won't fly here.

If the change that generates your alternate history is just who won a battle or how somebody made a decision at some juncture in recent history, that doesn't make it science fiction in the eyes of our readers. *A Different Flesh* succeeded admirably as *both* alternate history and science fiction because it postulated a much bigger change, involving a whole ecosystem developing in a completely different way than it did in our past.

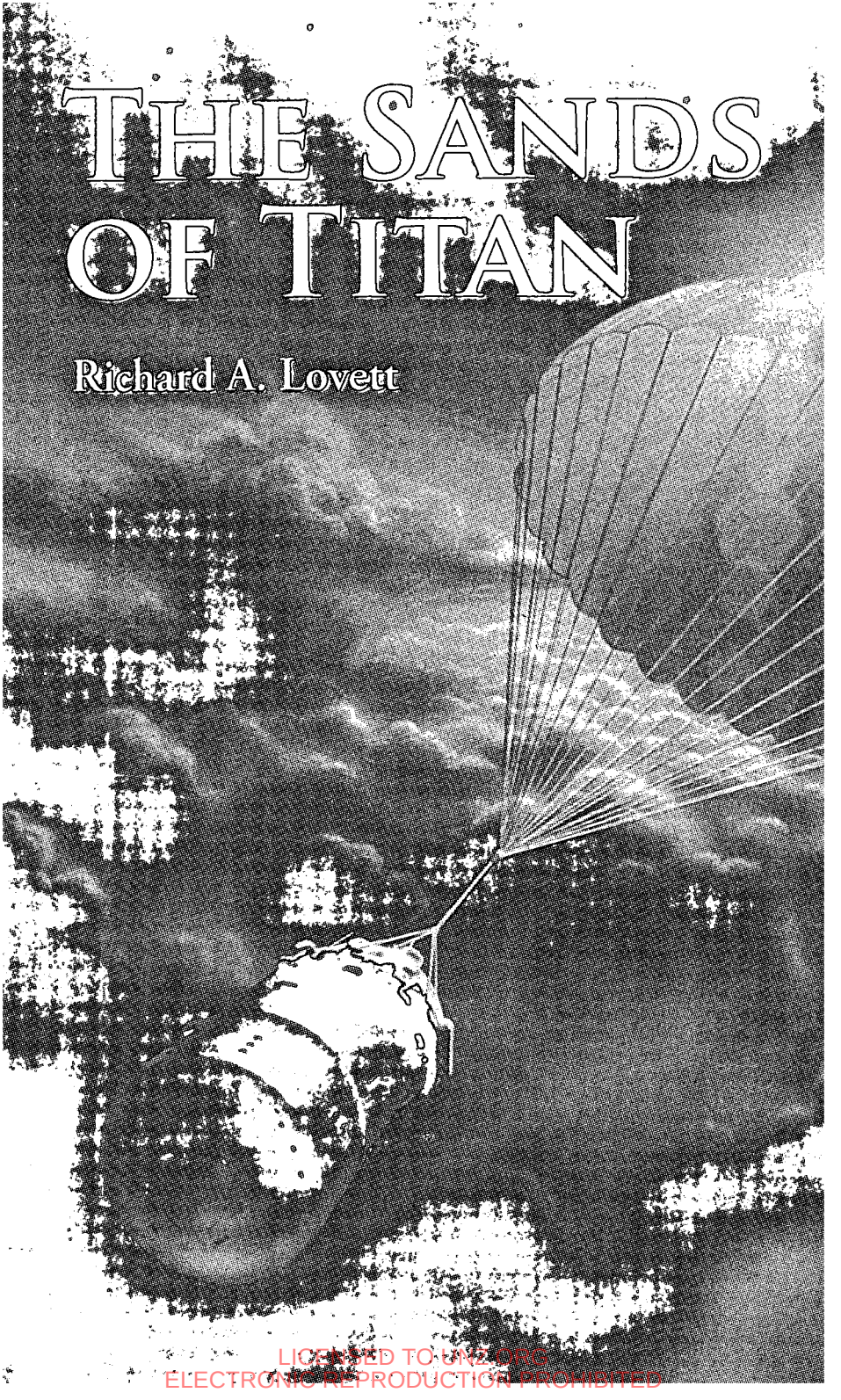
So there are some things that fall clearly enough outside "our" borders, and I hope you might find these comments helpful in getting a better idea of what they are. But I hope they will also leave you with the realization that there's an awful lot of territory *inside* those borders—and that some of the most memorable stories may be set in those foggy borderlands. ■

We welcome your letters, which should be sent to ***Analog,*** 475 Park Avenue South, Floor 11, New York, NY 10016, or e-mail to **analog@dellmagazines.com**. Space and time make it impossible to print or answer all letters, but please include your mailing address even if you use e-mail. If you don't want your address printed, put it only in the heading of your letter; if you do want it printed, please put your address under your signature. We reserve the right to shorten and copy-edit letters. The email address is for editorial correspondence *only*—please direct all subscription inquiries to: 6 Prowitt Street, Norwalk, CT 06855.

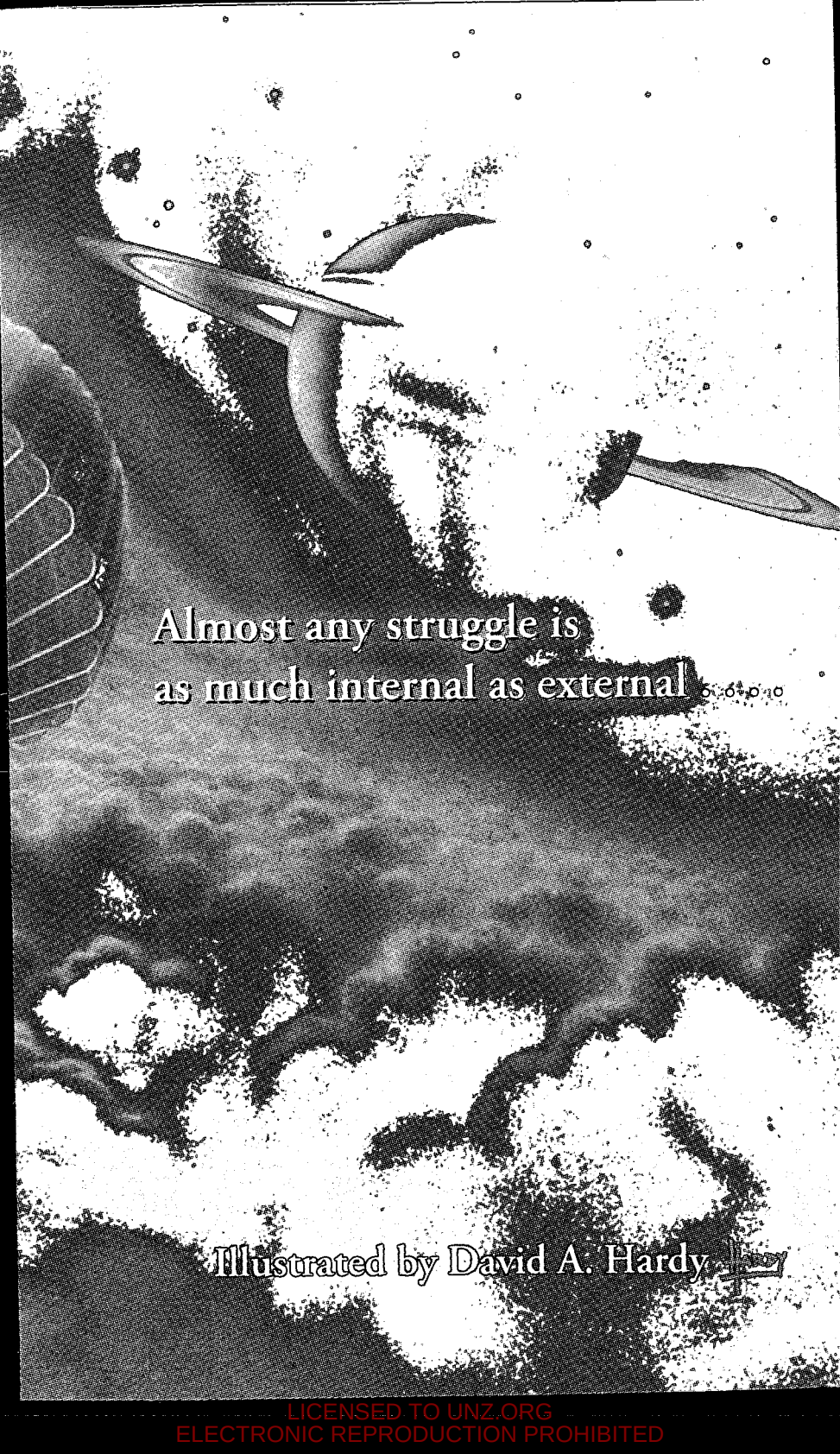
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE SANDS OF TITAN

Richard A. Lovett



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I'd always wondered what it would be like to be dead. Not that I've been in a big hurry to find out. And certainly not three times in one day.

Obviously, I'm not talking about *dead* dead. Not yet, anyway. I'm talking about that "Oh crap, this is it," feeling that (I now know) is the closest I'll ever get to having my life flash before my eyes. The type of feeling my parents must have had in San Francisco, when the Big One dropped half the Terra Bank Tower on them and a whole street full of others. Only in their case, that really had been "it." I was seven at the time, but I vividly remember learning, when the clean-up crews finally dug out the bodies, that they'd died right next to each other, apparently holding hands. That's the type of thing that haunts a kid's dreams: knowing they'd had at least a couple of heartbeats to see what was coming and realize there was no escape.

In my case nothing was falling on me, though it kind of looked like it as the red-orange surface of Titan rushed toward me, way too fast. It was like a scene from Hell: dirty-orange sky, duller orange clouds. Orange-brown haze merging into the distance; orange and black shapes below. All of it no better illuminated than a ship cockpit, dimmed for direct-view navigation. Only now, there was nothing between me and all that orangeness but a skinsuit and a lot of . . . well, can I call it "air" if it's four times thicker than ship-normal, laced with methane, and at a temp of ninety-five Kelvins? If it is air, it's air that would probably freeze me faster than it would asphyxiate me if I was unfortunate enough to still be alive when the impact ripped a hole in my suit.

My name is Floyd Ashman, though that's just the handle I was born with. Most people call me Phoenix, because it's one of the places I come from, and the play on my real name is kind of clever—though right now I certainly wasn't rising from anything.

Moments earlier, I'd been dangling from a parachute, light as a feather. Then there'd been a sickening lurch, and here I was, no longer dangling but back in free fall, which this close to a planet's surface isn't a good thing—even if my spacer reflexes were insisting that rather than me being the one who was moving, it was the planet that was reaching up like a giant flyswatter, about to whack me out of the sky.

Not that it made any difference. Impact is impact. Though it was weird how it all seemed to be happening in slow motion, with way too much time to wonder, for what I figured was the final time, what exactly my parents had thought as they watched all that plate glass shower down in a deadly rain of knives. I even had time to wish I had someone to hold hands with, although I guess that would mean she'd be about to die, too, so maybe it was a good thing I'd never been the type to put down roots, even temporarily.

All told, the fall took about three eternities, though I couldn't have said whether they were milliseconds or years.

Then we hit.

I'm a spacer, not a ground rat (at least, not for a long time), so when the tumbling ceased, I had no idea why I was still alive. Though one thing was obvious: it was my lucky day. I'd survived the demise of my tug and a dicey entry into the atmosphere in a damn cargo canister. Then, since the canister had been designed for a twenty-gee impact and I wasn't, I'd been forced to jump with a jury-rigged parasail, cobbled together from the canister's stabilizing chute in the way-too-few minutes Brittney and I'd had to try to figure out if there was a way to survive a drop onto this forsaken smog ball.

Now, somehow, I was down alive. So it was either the luckiest day of my life or the worst, depending on how you looked at it. If I lived long enough, maybe someday I could sort out that

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

type of philosophical stuff. Meanwhile, I just wanted to know why I was still around to think about it.

Happily, I didn't have to figure it out myself.

"Bull's-eye!" a perky voice said, sounding like it was right in my ear. Brittney can do any mood she likes, but perky is her favorite. "Though it would have helped if you'd bent your knees and braced for impact, rather than screaming all the way down."

I thought I'd been remarkably calm, but I've learned not to argue with her about things like that. She has a nasty tendency to have recordings.

"You mean you did that deliberately?" I asked instead.

From the moment we'd touched atmosphere, Brittney had had control of our descent. Not that there'd been a whole bunch to control. Once the canister had dropped its heat shield and was down to a reasonable velocity, it was mostly a matter of popping the hatch and leaping out.

In the panicked preparations back on the tug, there had been time (barely) to give Brittney radio control over the servomotors that ran the smart-chute's shrouds—though without the weight of the capsule, the whole contraption had proven about as steerable as a feather in a hurricane. I'd also given her control of the chute release, so we wouldn't get wind-dragged if we actually reached the surface alive. But I'd never expected her to trigger the damn thing when we were still I-don't-know-how-far up.

"Sure." Brittney doesn't actually speak, though it seems like it. In theory, she could use the suit radio, but her voice usually comes to me via a nerve implant in my right ear. "We were heading toward a lake, so I dropped us on a big dune. We hit the slip face, which cushioned the impact just enough to keep you with me." She was chattering, as in the aftermath of adrenaline shock, even though she has no adrenaline and should damn well be immune to mine.

"I'll admit it was a bit iffy for a moment. In one-seventh gee with four standards air density and way more wind than there's supposed to be, the drift radius was a bit wide."

I'd never heard of drift radius, though I got the idea. "Wouldn't the lake have been softer?"

I'd swear she sighed, though technically, that's not possible. "And what do you think the lake is made of?"

Brittney is my symbiote and lives in a distributed chip network beneath my ribs. She keeps telling me she'd be safer in my skull, which might be true, but I'm not letting anything share space with my brain. Until she went sentient, she was the best investment I ever made, if a drunken wager of everything I owned qualifies as an investment. Since then, she can be a real pain. I keep threatening her with reprogramming; to start with, there's nothing like mixing your consciousness with something that sees itself as a seventeen-year-old girl to put the kibosh on ever having a real person with whom to hand-hold while facing imminent death. But Brittney's terrified of personality adjustments, even though other AIs tell her they're no worse than memory upgrades.

Telling Brittney to shut up is useless. Partly it's the age thing. It's kind of like dog-years, I guess. It was only ten months ago that she went sentient; now she thinks she's on the verge of adulthood. Who am I to argue? When she goes pedantic on me, it's easier just to play her game.

I considered what little I knew of Titan. Not much, I'm afraid. I'd been kicking around Saturn since I'd come here from Jupiter, two years ago, but my knowledge of its largest moon could be summed up in a few sentences. Big gravity hole. Dense atmosphere. Great for parachuting supplies down to the scientists, who thought it was the coolest place ever. But scientists always think that about anywhere, so I'd not paid much attention. One of my contracts is

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

to catch supplies E-railed to them from Earth orbit and line up the canisters to parachute to the surface. It takes a couple of weeks per annum, pays well enough, and is one of those great jobs where nobody bothers you unless you screw up. Good stuff, in other words, for an orphan whose psych profile probably said things about attachment disorder or whatever they call it when you think alone is the best place to be.

It also had to have been one of the dullest jobs in the System until something smacked me good—probably a comet chunk on a hyperbolic slingshot from outer nowhere. Then it got way too exciting, and I'd been forced to drop myself along with the supplies. Or more precisely, without them, because they were still in the damn canister. Right now, all I had was myself, my skinsuit, and Brittney . . . who, in whatever it is that passes for AI adrenaline shock, was babbling about lakes. Someday I really will have her reprogrammed.

In the meantime, though, I had to live with her, so I forced myself to think. Methane atmosphere. Lots of sunlight at the top. Smog central at the bottom. Something that would be liquid at ninety-five Kelvins. I'd read about that, long ago. Hell, it was probably back in grade school. It's amazing how that type of stuff sticks. I could still name the capitals of half the member states of the U.N, and I'd not been on Earth in nearly twenty annums.

"Liquid ethane? Hydrocarbons of some sort." Anything else would be frozen solid. Hell, the dune I'd landed on was probably ice grains, dirtied by something orange and chemically weird. But it sure looked like good, old-fashioned sand. A bit coarser than Earth-normal, but sand nonetheless.

"Not bad," she said. "Most likely methane. Or a mix. Any guess what would happen if we hit a lake of methane?"

I swear, I really am going to reprogram her. "We'd go splash?"

"Well, yeah. But then?"

"Swim?" The skinsuit was designed for vacuum or atmosphere, but would probably keep me warm in liquid, at least for a while.

"Not likely. What are you made of?"

"Damn it, Brittney . . ."

"Okay. The answer, genius, is water. Mostly, anyway. Specific gravity, 1.0, give or take a bit. Ethane has a specific gravity of 0.57. Methane's worse. Something like 0.46. It doesn't matter that this is a low-gravity world; the ratio's the same. The point is, we'd sink like a stone. Right now, you'd be walking around on the bottom of a methane lake, trying to find the way out, and I do *not* give either of us a good chance of that."

Okay, so maybe I won't reprogram her. Though it would have been nice if she'd told me what she was doing before cutting us loose from the chute.

For that matter, where had the chute gone? Not that it made any difference. What I needed was the canister. Somehow I had to find it with the suit's short-range com and its supplies, survival-rated for twenty-four hours average EVA—plus whatever Brittney had learned about Titan from my ship's library while I'd been jury-rigging the chute and shoving everything I could lay hands on into the canister.

The dune was nearly a hundred fifty meters tall and steep, which was why I'd rolled forever when I hit. Based on the furrow I'd plowed at one point, there'd even been an interlude when I'd been more or less body surfing. When I was eight, I'd done that on the Kelso Dunes in the Old Mojave Desert—the part of the desert that had existed before global warming expanded it across big chunks of four states. Those dunes, which had been there since the last ice age, had incredibly fine sand piled at just the right angle that you could slide headfirst on your belly, propelling yourself with breaststroke-like swimming motions. If you did it just right, the sand would emit this wonderful bass tone that would per-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sist until the slope abated and swimming turned into useless flapping. The guidebook said they were one of the world's few "booming" dunes, though the tone I got sounded more like an oboe.

I loved those dunes. I think it was the first time I'd been happy after my parents died, and I ran up and slid down all day, until it got dark and my foster parents took me away, saying they were never going to let me near a sand dune again. They weren't mean people; they were merely way too conventional for a kid who craved open spaces where there was nothing to fall on you and no people who could up and die on you, because there were no people at all.

At least, that's what the shrinks said when they green-lighted my tug license but felt obliged to warn me I was running "away," not "to," and that until I reversed that I'd never find what I craved.

Well, now I was about as far away as one could get. And unfortunately, not only was I out of practice on dunes, but I'd not been doing more than minimal strength training for years, which meant that one-seventh gee might be all my muscles were adapted for. After all, muscles were for ground rats. And my ground-rat days, I'd thought, were long gone.

The sand was weird stuff. Not because it really was strange but because it looked so normal. Even the color wouldn't have been all that out of place at Kelso, at least in the tail-end dusk of the perfect sunset that ended that glorious day. Who knows, maybe an eight-year-old could make these dunes boom, too.

They were also just as hard to climb.

Halfway up, I wondered if maybe I was doing it the hard way. To cushion the impact, Brittney had dumped me on the steepest spot she could find, so it stood to reason that there might have been an easier way. I was kind of surprised she'd not said anything, but maybe she too was anxious to see the view. On the ship, she could tap into any properly telemetered interface; now, all she had was the ear implant and a feed from my optic nerve. She didn't even have my other senses because, useful as she was, there was only so far I was letting her into my mind. For the same reason, I speak to her aloud, via the ear implant. A subvocalizer might be more private in a crowd, but I'm seldom in crowds and there's too much risk of subvocalizing your thoughts.

It probably took less than five minutes, but my heart was going like a trip-hammer when I finally ran out of "up." Bent over, gasping, I crested the dune—and damn near got blown off my feet. No wonder the chute had been so hell-bent on landing in the lake. In this atmosphere, that wind packed a serious punch.

"For heaven's sake," Brittney's voice pierced through the hammering of my heart, "would you look *up?* All I can see is sand!"

It was *my* lungs that were on fire, not hers, but I compromised by sitting down so I could recover while we scanned the view.

The lake was out there, just as she'd said. Wind kicked up weird whitecaps on its surface. It had been years since I'd left San Francisco and never again gazed on an ocean, but something about the waves seemed wrong. Too steep? Too slow? The wrong spacing? I couldn't place it. The dune had looked remarkably earthlike. The lake did not.

Brittney either didn't notice or didn't care. "Oh, cool," she said. "See the chute? It's that white blotch, a few hundred meters out. I'd have expected it to sink, but maybe it trapped a bubble. That's more or less where we'd have wound up if it weren't for the dunes. And see that beachlike area between us and the lake? What do you bet it's saturated with liquid? Kind of like quicksand or mud. Super nasty to walk through. We really did hit the right place!"

The lake was big, but not huge, because I could see hills on the far side:

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

wrinkled slopes that seemed to float above the horizon like a damn mirage. I thought it took heat to produce that, but maybe it was the curvature of the planet. Brittney would know or be able to work out the physics from scratch, but I needed her to calm down and concentrate, or neither of us was getting out of this alive. She'd last a bit longer than me, but she needs me alive and twitching to power her piezoelectrics. Not that she doesn't know this. She's never going to forget how close she came to dying that time the geyser went off under us on Enceladus and I became the first person in history to get knocked unconscious inside a pressure suit and live to tell the tale. I didn't wake up for a week, and after she linked to my ship to call for help, she had to conserve power for days until the rescue crew got to us.

That was when she'd truly been born. Nobody knows why a few AIs achieve sentience, while most, like my ship's computer, are nothing but imitation intelligences. Really good at what they do, but with nothing to go with it but artificial personalities. In Brittney's case it had happened when she was waiting for rescue. By the time the doctors eased me out of my coma, she'd named herself and become a chattery twelve-year-old. However those AI dog-years work, they're not linear.

It's odd how her childhood, if I can call it that, mirrors mine. A true mirror, that is, in which things are partially but not completely reversed. In her case, she was the one who got to watch for days (an eternity in AI time) as death closed in. For me, death came when I wasn't around, and it was only afterward that I got to think endlessly about it.

For months, she'd harangued me for bigger batteries, so she'd have a longer survival time if something again immobilized me. Then she refused them when I finally gave in. She wouldn't explain why, which is odd because normally, Brittney will yammer about anything and everything as though she thinks that's synonymous with life. *I talk, therefore I am.* Eventually, I realized that if there's one thing she fears more than a power failure, it's being alone. Which makes us a truly odd pair.

The lake wasn't the only thing I found confusing. The dim light, haze, and relatively distant horizon made it hard to get a feel for the scale of this place.

"That's because Titan is about ten times bigger than the moons you're used to," Brittney said. She never mentioned Enceladus unless she had to. "But it's only one-third the diameter of Earth. From this elevation, the horizon's going to be about—"

"So what you're saying," I said to cut off the inevitable lecture in spherical trigonometry, "is that this place is big, but not as big as Earth?"

She hesitated, which meant I'd hurt her feelings. "Yeah."

"Where's the canister?" I hoped like hell it was somewhere high and dry, because she had me thoroughly spooked of lakes. Wading on the bottom, indeed. In the dark. Too much like having a building fall on you, even if we weren't talking about anything sharp and heavy. If I was going to die, I was damn well going to do so up here, where I could at least see. Or sort-of see. Which raised another question. "And how long do we have until night?"

I think Brittney grew up another year right then. I was expecting some kind of sarcastic what-do-you-think-genius comeback, pointing out that by necessity she hadn't seen anything I hadn't, so I could damn well guess where we were. Which was true, but she could calculate descent paths and wind drift and heaven knows what far better and faster than me.

"We're tide locked to Saturn," she said, instead, dealing with the second question first. "So the day's the same as the orbital period." I knew that much, but this time I bit my tongue and was rewarded by having her cut straight to the chase. "It's afternoon here, but we've

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

still got at least seventy-two hours of light."

"And the canister?"

"Over there somewhere." Then she realized that without an external interface, there was no way to point. "Okay, turn around, about a hundred fifty-five degrees."

I did a near one-eighty, to my right.

"Oh, damn"—I'd never heard her swear before—"I meant the other way. You usually turn counterclockwise. No, don't turn back. See the ridge off to the right, the one that looks like a sleeping alligator? Not that one, the one next to it. No, now you've overshot. Don't move, let's figure this out. Right now, I'd give my eyeteeth for a way to point."

"Not much of an offer." It was the closest I could come to apologizing for shutting her up earlier. "Given that the only teeth in the vicinity are mine."

"Yes, but you love figures of speech." In other words, *Apology accepted.*

"What if—" I started, but she was ahead of me.

"Okay. All I've got to work with are your eyes. So, scan the horizon slowly to the left, and I'll tell you when you've got it."

It, when I found it, didn't look much like an alligator, but then I've never had that type of imagination.

"So the canister's up there?" I had no idea how far away the ridge was. Five kilometers? Ten? I shouldn't have shut off her trig lesson, but I had too much pride to admit it. It looked walkable. No lakes, and the dunes got progressively smaller until they gave way to something that, from here at least, looked firm.

Then Brittney burst my bubble. "No, that's just the direction. Give or take a bit. We went through a couple of major wind shifts on the descent, and it's hard to figure out exactly how they would have affected the canister. The only thing I'm sure of is that it's heavier than we are, with a lot less chute-per-mass. So it had to come down faster, which puts it somewhere over there." She gave a very humanlike pause. "Unless something weird happened. We left the door open and that will have produced some oddities in the drag. Without better data"—again the pause—"it's just an educated guess."

Uh-oh. Though if I had to trust my life to someone's educated guess, Brittney's was better than mine. "How far?"

"I'm more sure of the direction than the distance. We opened the hatch way too soon."

That had become obvious when we'd spent the better part of the past two hours riding the chute down here. The problem had been that we'd stolen the canister's stabilizing chute, which meant that the canister was going to come down faster than normal. How *much* faster required all kinds of technical data that wasn't available, and . . . well, with no telemetry and nothing but Brittney's back-of-the-envelope calculations to go on, I'd been really gung-ho on popping the hatch earlier rather than later. At least we could look outside. Then, the canister had started swaying wildly and there was nothing to see but cloud, which might or might not end before we hit the ground. We'd argued a bit, but whatever else Brittney controlled, she didn't control my muscles, and I sure as hell wasn't going to die in that damn can. So we jumped. Then we'd drifted forever.

"How far?" I asked again.

"Surface winds on Titan usually aren't over a couple kilometers per hour," she said, in the same not-quite-talking-about-it manner she uses for Enceladus. "But we seem to have come down in the middle of what passes for a gale."

I watched sand particles skitter across the dune. "So what is it, fifteen or twenty kilometers?"

"Uh-uh. The winds were stronger, higher up. I don't know how fast we were going before we dropped below the clouds, but the total drift could easily be eighty klicks. Maybe a hundred and twenty. Somewhere in there."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Uh-oh, indeed. If I'd kept up my ground-rat muscles, an eighty-kilometer hike in low grav probably wouldn't have been too tough. Even a hundred twenty might not have been all that bad. Assuming we could even find the canister. As it was . . .

I took a deep breath, like a swimmer preparing to dive, or an actor trying to dispel the butterflies.

"Yep," Brittney said. "Time to get this show on the road. You walk; I'll give you landmarks to steer by." She was chattering again—more of that AI adrenaline stuff, I suppose. "Once we got low enough to see it, I did my best to map the terrain. The main things to worry about are box canyons. That and lateral drift. That's when, walking a compass line, you always veer in the same direction around trees. Of course we don't have a compass and there aren't any trees, but the canyons'll cause the same problem. . . ."

Thirty minutes later, I was still slogging through dunes. Well, not quite slogging: I clearly didn't have full ground-rat strength, but I wasn't as weak as I feared. As best I could tell, I had half-gee strength, which on a one-seventh-gee world was like being able to tote around a hundred or so kilos, back on Earth.

Long ago, when I really was a ground rat, I'd carried some heavy packs into some pretty remote places. Here, at least, I only had my own reduced weight, plus a few kilos for the suit. But soft, windblown sand is soft, windblown sand. If you try to run, it sucks the energy right out of you.

At first, I tried for some form of the old lunar shuffle, but it just didn't work. Every time I'd pick up a decent amount of speed and start to find the rhythm, I'd hit a supersoft spot and trip. In low grav you still have full momentum, so the result tended to be a nasty combo belly flop and faceplant.

After about a dozen of those, I gave up and remembered what I knew of soft surfaces from my backpacking days on Earth, which is basically that fighting them doesn't do anything but wear you out. But I'd never been in a situation like this before, where each step was a metronome, clicking away what little remained of my life.

Patience has never been Brittney's strong suit either. It's probably got something to do with the difference in our internal clock speeds. I think in terms of seconds, but she's got the ability to work in femtoseconds, or maybe something smaller yet.

For most purposes, she adjusts quite well. Talking to me, for example, she's very good at acting, at least, as though she's thinking in real time. Most likely, she actually is; even nonsentient personality interfaces require a humungous amount of processing time. She also has the ability to use variable-speed processing to make conversations more natural. But if she's obsessing about something—well, let's just say that there are a lot more femtoseconds in a second than most people have seconds in a lifetime.

"We're never going to make it at this pace," she said, just as we were finally reaching the end of the sand.

"Hopefully, we'll speed up."

"It's not speed I'm worried about."

"What, then?"

"Life support. As best I can figure, you've done about four kilometers. But you've used up a lot more than four percent of the air. And you're using water even faster."

"I was thirsty, damn it." I could see the gauges as well as she could. The suit carried two liters of water; I'd drunk a tenth of it. In a pressure suit, that would be no problem; it would just recycle. Here, I was breathing bone-dry O_2 and venting excess water vapor along with CO_2, through the selective permeability membrane in the suit's skin. Not much I could do about it.

"Look," I said, "I may not be able to do spherical trig in my head, but I know a thing or two about deserts." And even

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

though this place was colder than Hell, it certainly *looked* like a desert. "Rationing water doesn't work. Trust me, you just get tired sooner. The best approach is to drink what you need until you run out."

Then of course, you have no choice but to suffer, which is why everyone is so desperate to save the last drops. But physiologically, that's counterproductive.

"Trust me," I said again, mostly to reassure myself.

"How do you know all that?"

"It doesn't matter. I just do."

She surprised me by accepting that. "Okay. But water's not the main problem."

"No kidding."

"Hey—"

Damn. I'd hurt her again. Hell, it wasn't her fault the ship had hit a rock. It was mine for not having upgraded the sensors. It's just that rocks like that are so incredibly rare, and there's never enough money to go around, so I'd bought the skinsuit instead. Which was good, given that we *had* hit a rock, but not hitting the rock would have been better.

If you start playing that kind of what-if, though, you can chase yourself in circles forever. Whatever psychological quirks the license-board shrinks thought they'd found in me—and I've never met a solo-boat pilot without a few—getting caught up in the what-if game isn't one. If I'd been prone to it, I'd have found a hundred and one ways to blame myself for my parents' deaths and probably never have made it out of childhood alive. I'd come close enough, as it was.

I knew what I needed to say, but couldn't form the words. "Yeah," I said, in what was at least an acknowledgement I'd been off base. "Tell me about the air."

When we'd left the ship, I'd topped off the suit to a full charge of compressed gas. It really was a state-of-the-art suit, which meant it carried the air in monomembrane bladders behind my back, shins, thighs, etc. They left my joints free to move but made me look like a gene-freak bodybuilder. I did not want to think what would happen if one of those bladders burst; I'd probably shoot off like a punctured birthday balloon, leaving my heirs with one great lawsuit against the manufacturer. If I'd had any heirs to notice I was gone.

Brittney was slow to answer, and it dawned on me that she was wrestling with a whole new level of feelings. "You've been using it kind of fast," she said at last.

I checked the gauge for the umpteenth time, but it was still pretty close to full.

"Specifically," she said, "you've used 7.3 percent of your oxygen for only five percent of the minimum possible distance."

I stared again at the gauge. "You can read it that accurately?" It was a simple dial, ticked off in hash marks. Fancier gauges exist, but too many spacers have died from a surfeit of numbers. *Good, okay, not so good, get the hell home.* For most stuff, that's all you need.

"No, the suit's telemetered. It took me a bit to find the wavelength, and it would have been nice if you'd had time to hook up the medical stuff, but there's all kinds of technical info, including instantaneous airflow. Thanks for getting it for me. In other circumstances it would be lots of fun."

I'd been continuing to walk, but that last comment almost caused me to break stride. For the first time, I found myself really wondering what life looked like from Brittney's perspective. Maybe the little-girl thing and my own I'm-going-to-reprogram-you threats had had me fooled. I *knew* she was alive in a way few computers achieve, but I'm not sure how strongly I'd ever really *felt* it.

Hell, I'd not had a chance to use the skinsuit before and didn't even know it was so well telemetered. The idea that it might matter to Brittney had never oc-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

curred to me.

"You're welcome," I said, hoping it didn't sound too much like an afterthought.

We walked in silence, while I thought about Brittney and oxygen, and tried not to think about death.

Ahead, her alligator hill rose closer, looking more like a mountain than a hill. Though without trees or people for scale, everything tends to loom large.

"Okay," Brittney said as we stepped off the last of the sand onto rounded stones that weren't a whole bunch easier to walk on. "We don't actually want to climb that thing. Veer left and go up the gully." Again the pause. "I hope." More pause. "My map's not all that good."

"It's not your fault I couldn't see much," I said. Or that I'd not had time to rig any kind of decent instrumentation for her, like radar. She'd been doing everything by dead reckoning. If we lived, it was going to be because she was very good at it. If we died, it would be my fault for getting the suit rather than upgrading the ship. And she thought I'd gotten it as a toy for her. Crap. "Do the best you can," I added. "That's all anyone can ever ask."

She was silent for about ten paces. "Thanks." More paces. "I mean it."

If I'd been on Earth, I'd have described the stones as river cobbles. Brittney's gully was thirty meters wide, with multiple scour channels and more of those rounded cobbles underfoot. In the Old Mojave, I'd have called it a "wash."

In the desert, washes are a mixed blessing. Sometimes, they're like highways, but they're tricky because it takes amazingly little to stop you cold. Brittney had mentioned box canyons, but a boulder jam or a two-meter ledge is all it takes. Well, in this gravity, maybe a bit more than two meters. But I'd rather not have to test my leaping ability.

Nor are washes the easiest places to walk, though on Earth, the footing tends to get easier as you climb. Luckily, that worked here, too. Lots of small, ankle-twisting stuff down low. Bigger, firmer stuff as we went—I guess I'll call it inland. Still, I wasn't managing anything faster than a sort of bouncy walk.

As in the dunes, I couldn't believe how familiar the landforms appeared. "It looks like it flash floods here," I said. "Frequently."

"I wouldn't worry about it. Mars has river channels. It hasn't rained there for a while."

"Good point." I'd not really been worried, but Brittney had been unusually subdued, and there was no harm in letting her talk a bit. "Rain here must be pretty damn weird."

"Liquid methane. And those cliffs over there that look like granite?"

"Yeah?"

"They're probably ice. A lot of these uplands are cryovolcanoes." Again she surprised me because that's all she said. In the old days—gads, was it only this morning?—she would have carried on for twenty minutes about the details of cryovolcanoes, when she damn well had to know that I knew the basics. Pretty much like earthly volcanoes, except that the lava was ammonia-water slush that was only hot in climates like this.

I found myself puffing harder and glanced back. Hard to tell, but from the glimpse I could see of distant sand, V-ed in the notch of the canyon walls, it looked like we'd ascended quite a bit.

"How are we doing on air?" I asked.

Brittney must have been waiting for the question. "Better, but still unsustainable. Initially, you were making six kilometers per hour, with a maximum range of sixty, assuming no rest breaks, which seems unlikely. You've upped it to eight or nine kilometers per hour, but you're burning gas at the same rate, so your range is still under a hundred. And this gully keeps curving back and forth, so not all of those klicks are in the right direction."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"In other words, this isn't going to work."

"I didn't say that."

"No, I did." I stopped and sat on a boulder. Or a big ice cube. Gads, how can a place so familiar looking be so weird?

I knew what I had to do, but first I wanted to deal with another problem.

Most of my life, I've been alone. Now, I was with someone who depended on me, whether I liked it or not. Someone who could think in femtoseconds and had way too many of those in which to worry. But someone who'd synched her pace of life to mine, which meant that when she thought about the air running out, it wasn't simply a bazillion femtoseconds away, it was . . . well, tomorrow, for her as for me.

What she needed was something more to do than study a fuzzy map, watch my air, and worry that she might be leading us to our deaths. It would be even better if I could make her believe it was useful.

"Do you know what a MET is?" I asked.

"Uh, no. Should I?"

"No, it's not spacer stuff." I sighed and stood up. The wash here was too steep for what I had in mind. Hopefully I'd not waited too long; having to backtrack would be a disaster.

"It's basically the amount of oxygen you're consuming at rest."

"Zero?"

"Very funny." Actually, the joke was a good sign. Maybe she wasn't as disheartened as I'd feared. "Okay, the amount that *I* consume. How precise is that telemetry?"

"Moderately. Right now you're using 980 milliliters of oxygen per minute. It's been as high as three liters."

That would have been when I was killing myself, trying to get up that dune. "What's the lowest?"

"When you were resting, it dropped to 320 but it was still going down."

"Okay. Let's say 250; for my body size it should be somewhere in that vicinity."

"That means you'd last about sixty-four more hours, sitting on a rock. Maybe more if you fell asleep."

"Good. You're getting the idea. At twenty METs, we'd have a bit less than three and a half hours." Not that anyone could sustain that pace. "At ten"—which once upon a time I could sustain for quite a while—"the air would last twice as long."

"Okay. Now, you're up to 4.7, but you're barely doing seven klicks per hour."

"That's because the terrain's getting rougher."

I was getting very nervous about the wash. I didn't care if it was formed by a methane river carving through cryovolcanic ammonia-water ice, it was narrowing and getting steeper, and those were *not* good signs. An unclimbable ledge was a very real risk. Hell, maybe we'd find a waterfall with a pool of stagnant methane at its base. Even if it didn't rain very often, it must take the stuff forever to evaporate. I guess I could nerve myself to wade a small pool if I had to, but wading and boulder clambering would be slow, hard going.

"So that's your job," I said, though really all I'd done was give her a new number to play with. "Help me find the effort level that gives the biggest bang for the buck."

"I can tell you right now that that wasn't the first hour."

"Of course not! We were on *sand.*" And those damn cobbles in the lower part of the wash. My turn to pause. "You won't like the next bit either."

Ahead, the wash was choked with boulders the size of the supply canister. On Earth, I'd never get through without a rope. Here . . . well, I'd rather not have to try. It looked too much like the type of place where things might fall on you.

What I'd been looking for was a nice sloping rampway, but everything was surprisingly steep. If I slipped and started tumbling, it was going to hurt, even

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

in low gee.

Brittney had figured it out. "You're going to climb out?"

"Yep."

"You're going to burn a lot of air."

"Yep."

I'd said she wouldn't like it.

It wasn't too bad at first. Underneath, the mountain might be made of solid ice, but its surface was covered in fallen rocks and coarse, soil-like material. The result was a lot of nice steps. Steep but manageable.

But cryolava apparently comes in layers, just like ordinary lava. As I climbed, I encountered cliffs, like tiers in a wedding cake. Each time, I had to traverse loose scree, looking for breaks that offered climbable chutes. Weird, weird, weird. Basalt produces such landforms. But ice?

Several times, I had to resort to hands to pull myself to the crest of a particularly steep layer—only to find yet another tier above. The higher I climbed, the smaller the rocks became and the more they tended to roll at the slightest touch. Once disturbed, they went forever, tinkling in slow-moving avalanches until they disappeared over the lip of a cliff.

"Why the hell does everything *move* like this?" I exploded, at last. The climb was taking forever, and each time I had to fight bad footing, I squandered oxygen. "Why doesn't the low gravity make it more stable?"

"The angle of repose is the same as on Earth," Brittney said. "That's the steepest slope at which you can pile rocks without having them start to roll. When you run the math, the force of gravity cancels out, at least on first order. It's not what they call intuitively obvious."

"Intuitively obvious?"

"A phrase. For your benefit."

Like hell it was. Brittney's as capable as I am of being surprised. The only difference is that for things like this, she's really good at figuring out the answers.

* * *

It took twenty-six minutes at slightly better than nine METs to reach the top. A nasty dent in my oxygen supply, for essentially no progress toward the canister. Other than reporting the number, Brittney said nothing. I said nothing. Had it been worth it? Time would tell. Still, I felt a new lease on life: an emergence from claustrophobia into a realm where you could at least see the horizon.

We were higher than I'd expected; apparently the cryovolcano humped up inland. Brittney's alligator ridge was somewhere below us, unrecognizable from this angle.

"This thing's big," I said.

"Yes. Out here, its edges are chewed up into a lot of ridges and gullies, but from what I could see on our way down, its interior might be what the volcanologists call a pancake dome. Some of those are more than a hundred klicks across. If we're lucky, the canister's somewhere up on top."

That wasn't as reassuring as she meant it to be. "And if we're not?"

"It's down in some canyon. Or off in more sand dunes on the far side."

Not reassuring at all. The only way we were going to find the canister was if we got close enough for Brittney to talk to it via the suit's short-range com channel. That was going to take line of sight. If it was down in a canyon, we could walk right by it without knowing. If it was far out in the sand, we'd never reach it before I ran out of air.

Well, there's one thing about life as a spacer. I'd long ago learned that when things go sour, you concentrate on the things you can do. As for the others, you either try to pretend they don't exist or pray about them, depending on your orientation. Me, I wasn't in the praying camp. I'd presumed Brittney was the same, but you know, I had no idea why. Another thing we'd never discussed.

Nor would we now. "Which way?" I asked.

The hesitation was longer than ever. Maybe she *was* praying.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Best guess," I said. "The only wrong answer is 'stay here.'"

"Thanks. Really. This is awful." She needed to be able to truly sigh. Or gulp, or something like that. "Okay, do a slow three-sixty. It was hard to keep my bearings down in that canyon. And climbing out was worse."

I complied. What I could see of the pancake dome was a broad mound, forming the horizon in the direction I'd been calling inland.

"All right," she said. "Look a bit to the left of the highest point. That's it. Let's go that way. The good news is that I think you climbed several hundred meters. The elevation won't hurt when it comes to getting a signal from the canister. But we've got at least sixty kilometers to go. And it could be a hundred."

Sixty klicks. In one-seventh gee, but with spacer-weak muscles. At least the footing was good. The ridge top was smooth, as I'd hoped, almost as though it had been wind blasted. Too bad Brittney hadn't thought to tell me about pancake domes before we'd started walking the wash. Washes aren't the only highways.

Ten minutes later, I was trying to remember how long it had been since the last time I'd run. Running is impossible in zero gee except on a centrifugal wheel, and not only was my ship too small, but wheels always make me feel like somebody's pet gerbil. I preferred stationary cycling. Unfortunately, that doesn't use quite the same muscles.

That said, I was making good time. "Twenty-one klicks an hour!" Brittney sang out. "Seven-point-eight METs! That's 2.7 kph per MET. Is that the right unit?"

"As good as any." I'd only given her the job to keep her busy. "What really matters is that I'm doing a pace at which I can carry on a reasonably normal conversation."

"Doesn't that waste air?"

"No. Where'd you get that idea?" You often find that old myth on vids, but other than the small amount of energy it takes to use your vocal cords, talking simply moves air in and out. The oxygen's still there.

"From Ship," she said, vaguely. She always referred to my tug's computer that way, as though she hoped someday to positive-think it into sentience. Thankfully, she hadn't succeeded. Two Brittneys would have been one and a half too many. "How do you know so much about this stuff?" she added.

Damn. I'd forgotten about her idea of normal conversation. I stalled, trying to figure out whether I was willing to talk about this.

"Have you ever heard of 'To Build a Fire'?" I asked eventually. Silly question. I was talking to an AI. Why would she care about things like that?

But I really hadn't spent enough time thinking about what it meant to be a *sentient* AI, with nothing much to do at night but scour Ship's library and hope I didn't die in my sleep. "Yes," she said. "That's the Jack London story about the gold prospector who freezes because his hands got too cold to strike a match."

I was impressed. "Right." I paused. Why didn't I want to talk about this? Just because it was a reminder that we might die, too? That was impossible *not* to think about. "Okay. The part that struck me was the image of him collapsing, unable to take another step. I kept thinking, how can you not be able to take one more step? And if you can do that, why not another, and another?"

"Uh, there's an obvious flaw to that reasoning."

"Of course." I knew that, in theory at least. "But there were a few years when I was obsessed with endurance." Or, at least, with the *idea* of endurance. "I kept trying to find that limit in myself: the point where you really can't take another step."

Long pause. "Did you?"

"No." Not in six marathons and a cou-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ple of Ironman triathlons. Not in a three-day, 1,200-kilometer bicycle race. I'd found times when I didn't *want* to go on, but none when I couldn't.

"Good."

It crossed my mind now that maybe what I'd really been obsessed with was whether my parents might have been able to *will* themselves to live another second. Or a femtosecond. And then another, and another after that, until finally they were rescued. That the only reason they weren't with me now was that they hadn't wanted it enough. Silly, but that's how it is with obsessions. Along the way, I'd picked up quite a bit of exercise physiology, though I couldn't see how it would help me now. The marathoning was a different matter. I might be out of practice, but I was hitting my second wind. Maybe I'd just been tired from the long scramble to the ridge top.

"Two point nine kph per MET," Brittney said. "Good job."

The running remained easy, and gradually the ridge merged into a flat, uninteresting plateau—though under the circumstances, uninteresting was a great word. So was flat. While going downhill would be easier, the longer until it happened, the greater the chance I'd still be in uninteresting terrain when I found the canister. Brittney said we'd covered thirty-four kilometers since the sand dunes. If our luck held, we might just make it.

She didn't try to start another conversation. Other than progress reports and a periodic "How's it going?" she pretty much left me to my thoughts. Normally, I'd have appreciated that, but at the moment, I wasn't too fond of them. Too much unanswerable history. Not enough . . . not enough *what?* It wasn't as though I hated it out here on the dark edge of the Solar System. The scientists were right; it's a pretty cool place. Though I'd rather not die here.

"Slow down," Brittney said suddenly. "And try taking shorter steps."

"What?" Even though I'd never been fast enough to win one of those long-ago races, I'd taken pride in coaxing my body to the best it could do. And now, Brittney—a bunch of code who had no idea what running felt like—was telling me I was screwing up. "I know what I'm doing."

"Maybe. But you've been gradually speeding up, and your kph per MET has been dropping. Not a lot, but enough to reduce your range by several klicks."

I'd not paid much attention to sports since I'd left Earth. Now, as I forced myself to comply and not argue with her, I wondered what the rules were about AIs in the Olympics. If Brittney could do this by dead reckoning, what could she do with real data? In fact . . . "How the hell can you measure my speed?" I asked. Or distance, for that matter.

"Retroactively. Any time we reach a landmark, like that big rock over there, I can tell how large it is. Then I rewind to when you first saw it and calculate out how far away it was. I also count steps. It's not super accurate, but it ought to be good to within about ten percent. More importantly, it should be pretty consistent, so I can tell if we're speeding up or slowing down."

"Very slick. I had no idea you were recording all of that."

"You never know when something might come in useful." She gave me another of those odd pauses. "Like Jack London. It's nice to know more about what makes you . . . you."

The run continued. Monotony, with life and death hanging in the balance. And increasingly, pain. Not long into the second hour, my second wind deserted me. Balance required more concentration. Sweat lathered the inside of my skinsuit before my body heat vaporized it and drove it away. I felt as though I was running in a sauna, which was weird, given how cold it was only millimeters away.

I was also increasingly aware of the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

density of Titan's atmosphere. It magnified every puff of breeze to buffeting force. The storm had abated considerably, but it still felt like running through molasses. I slowed again, and felt oddly reassured when Brittney didn't comment, one way or the other.

At the two-hour mark, I broke to a walk and sipped some water. Three-fourths gone. The last part of this trip wasn't going to be fun. While I was at it, I took a few swallows from the suit's food tube. It was another of those things I'd not had the opportunity to test before my life depended on it: I had no idea what it was. Brittney had searched the specs, but come up blank; the food was whatever the suit manufacturer had filled it with in the factory. All I knew for sure was that it was sweet and had a near infinite shelf life. Sweet was good. Not having to worry about food poisoning was better. But the syrupy goop was running out quicker than the air or water.

Brittney didn't comment directly. "You'll make it," she said instead. "You're doing good."

For some reason, that bugged me. Maybe because however well I was doing now, *good* wasn't a likely prospect for the future. There's a huge difference between taking another step, and doing so quickly. In my endurance-envelope-chasing days, I'd sure as hell learned that one a time or two.

"Wha'd you do, read a damn cheerleading manual?"

Brittney was silent for quite a while. Long enough that I could feel my breathing rate drop to something more reasonable. Long enough that I wondered if I might have knocked the perkiness out of her forever. Long enough that I again found myself wondering what life looked like from her perspective.

"Why did you go to space?" she asked eventually.

"Because Earth was getting too filled up," I said, though it wasn't really true. That's why I'd left Jupiter. I liked to think it was also why I'd left Earth, but the world's population had been stable for decades. I'd just given up trying to fit.

"So if you don't like company," Brittney said, seeing right through my pretense, "why did you get me?"

Because at the time, she'd just been an AI. An "it," not a "who." I had no idea she'd be the one in ten thousand that went sentient.

"Not sure," I said. "You do calculate a mean trajectory."

It was an invitation to shut up, but she ignored it. "I don't do anything of that type that Ship can't do."

"Well, Ship got clobbered by a meteor." Along with the radio that might have called for help, and about ninety-five percent of everything else useful.

I glanced at the suit's wrist chrono. I'd been walking for five minutes. Five-minute walk. Ten-minute run. That was a good formula, for as long as I could keep it up. "Time to run."

Again, she didn't argue: didn't suggest that six minutes' rest might be better. Or four minutes. Or five minutes and one second. In fact, for the next hour or so, she again didn't do much but keep me posted on numbers: METs and oxygen and how much farther we could go before I gasped my last—things like that. Why the hell *had* I gotten her? It didn't take an AI to do that stuff; a much simpler symbiote could do the same. And it for sure didn't take a sentient AI, though I have to admit I never thought of that prospect when I wagered everything to secure her.

The rest breaks were getting longer, the runs shorter. We'd crested the summit and were going down, but I wasn't going any faster. My efficiency was dropping: 2.9 kph/MET, 2.8, 2.5, and most recently, 2.2. My legs felt like lead, my breathing was coming in ragged pants, and the run/walk cycle had dropped from ten on/five off to two on/one off.

"How far?" I gasped for what must have been the tenth time in the last hour. I wasn't sure which was worse:

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

not knowing, or discovering I'd not even covered another half klick. I couldn't believe how hot it was in the skinsuit. The damn thing was built to keep me warm on the dark side of . . . well, Enceladus or pretty much anything else airless and cold. It could also reflect sunlight and keep me pleasantly temperate in the full glare of Earth orbit. What it was *not* designed for was continuous hard work.

"Coming up on sixty-two klicks," Brittney said. Anywhere from three-fourths to half of the way, depending.

"Air?" I'd not asked that for a while. I could always just check the gauge, but it was too easy to imagine big changes.

"Sixty-four point three percent down."

In other words, if my chute had drifted a hundred twenty klicks, I was dead meat. If it had been under a hundred, we might still make it if I didn't lose more efficiency, which wasn't likely.

Sometime later, I checked my suit chrono, but could no longer remember when I'd taken my last walk break. I felt giddy, floating for oddly prolonged intervals between strides, then striking heavily and off balance. I concentrated harder. *If you can take one step, you can take another. If you can take that one, you can take the next. Do it enough times, and Brittney will tell you when to rest. Artificially intelligent chrono, that's why you got 'er . . . Sentient chrono, gonna send us to the chronister. Chronister? . . . Canister. CAN-IS-TER . . . Canister, clamister. Caterpillar . . . Gonna crawl to the caterpillar. One foot after another. Lots of feet; just put one after the other.*

I must have said some of that aloud.

"Whoa! Stop!" The voice seemed to be floating between strides, just as I was. I looked at the chrono, but it was just being a chrono.

"Stop, stop! You're babbling. And weaving. Take a break, now!"

"'Kay," I said, and tried to sit down. But it was too much effort, so I just kind of flopped over and let the gravity drop me to the ground. The simple act of not running was making the brown haze spin above me. Or maybe it had been spinning all along and I'd not noticed. I closed my eyes, but the spinning continued. *One more step;* but I was lying down, not walking, and nothing happened.

So this really is it, I thought, though there was nothing falling on me. Instead, it felt as though I was the one who was falling, upward, into the spiral.

There was something important I wanted to do, while I could. Something about caterpillars and chronometers, something I could do even if I couldn't take another step. But I was having trouble thinking. I opened my eyes, but it wasn't out there. Then, through the spiraling, it came to me.

"I don't know why I got you," I said, fighting to keep my speech from slurring. Then in a moment of clarity—one of those things I'd heard sometimes precedes death—the answer flitted before me. Something about a companion who couldn't die on me, though I guess I had to amend that to *unless I did.* There was more to it than that, but the moment passed before I could fully grasp the rest. "But I never regretted it," I said. *Except for bringing you here,* I tried to add. But it was too late; the spiral had claimed me.

I woke to an explosion in my spacesuit. No, that wasn't right; the explosion was in my head.

I'd been dreaming of my mother. "Rise and shi-ine," she was saying, sounding way too much like Brittney at her perkiest. "Come back, Floyd. Pleeaaase come back. . . ." Then, while I was trying to figure out whether she was calling me to the Great Beyond or imploring me not to go, my head went pop.

For a spacer, there's nothing scarier than sudden noises. My mind felt like treacle, but even before I managed to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

open my eyes, I was listening for the rush of air. At least I didn't have to ask where I was, though I guess the orange-brown sky was a pretty good hint.

"What the hell was that?!" My head hurt from being jolted awake. My body hurt from everything. My eyes felt gummy. I wanted to rub them, but that was a luxury that didn't lie in the foreseeable future.

"At last!" Brittney said. "I thought you were going to sleep forever. I kept calling and calling and you wouldn't wake up. I was getting sooo desperate." She was babbling, but for some reason that made me happy. I couldn't quite figure out why, but most of my recent memories were rather vague. I'd been running, and now I wasn't.

"The noise?" I repeated. It was hard to shake the notion that any moment I'd be breathing Titan. In fact, the suit felt chilly, though maybe that was just my imagination.

"I, uh, snapped my fingers."

"You don't have fingers." My head still hurt, but my mind was returning to at least half speed.

"True. And according to Ship's vid library, it would have been better to throw water in your face. But this I could fake. And it did work."

I couldn't argue with that, though it might have been nicer if she'd been a bit more gentle. "How long was I asleep?"

"Well, I wouldn't call it 'asleep.' Two hours, but we used more air than that."

My eyes went to the gauge, but I couldn't remember what it should read. Right now, it was well into the *not-so-good* zone. Twenty percent? Maybe a bit more.

Above me, the sky looked brighter than before. About halfway up from the horizon was a hazy dot, like a docking beacon from fifty or a hundred meters. Brittney would be thrilled; even a dim sun would help her keep her bearings. The wind had abated. Obviously, the storm had passed.

"What happened?"

"Heatstroke or something close to it. It's hard to be precise without full telemetry. I overrode the suit's safeties and had it partially flush you with outside air a whole bunch of times. I had to do it in small doses to keep from frostbiting you. And you kept coughing, so I was afraid I was freeze-drying your lungs, but I think it was just some trace chemical. There's a filter that should have gotten rid of the worst of them. It was the only way I could think of to get your temperature down. The medical manuals said to put you in an ice bath. This whole thing's my fault. I keep replaying my recording of our departure from Ship, and there was time to hook up the medical sensors if we'd made it a priority. Here you've got all this great stuff in the suit, but most of it's disconnected . . ."

"Whoa." I had a bizarre desire to hug her. "You did good." Hell, she'd just saved my life. "And the things we did back on the ship made sense when we did them, so forget about it." Now that was an interesting thought. "Can you just erase that recording?"

"Yes." Another of those hesitations. "But I won't. It might come in useful. Besides . . . would you erase your bad memories if you could? Aren't they part of you, too?"

Too philosophical for me. I stood up, if the groaning motion of levering myself off the ground could be dignified by that term. My muscles felt like mush, and even that much exertion set my heart beating too hard. "Just how much air did we use?"

"With all the suit flushings? The equivalent of five METs for the whole two hours."

Crap. That was ten klicks' range, gone forever. If she wanted to blame someone, she should blame me. My failure to see the symptoms closing in had cost us a lot of air. Would I like to erase that knowledge?

"Aim me in the right direction," I said instead.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Okay." She hesitated. "But first, maybe we both need to learn a lesson from Esther."

"Who?"

"A biblical character. One of the things I found in Ship's library was the Bible, and I read about her, though I didn't understand her at the time. Now, I think I do. 'I will go to the king,' she said, 'and if I perish, I perish.'"

"Huh?"

"I'm paraphrasing. The context is complicated, but she was nerving herself to intercede with the king in a situation that was likely to get her killed. She thought about it a while, then just kind of shrugged and decided to just do the best she could. She lived; but what caught my attention was her attitude."

I was trying to absorb the notion of a computer citing scripture to me, let alone a Bible story I'd never heard of before. "Have you gone religious on me?" Earlier I'd wondered if she was praying. Could an AI *be* religious?

"Not the way you mean. But death to me looks the same as it does to you, so of course I wonder. No, this was just something I found. The point is, it's a good alternative to Jack London."

Fortunately, venting my suit was an oxygen-inefficient way to keep me from overheating again.

I say fortunately because I really didn't want to have to breath the outside air when I was awake. Instead, I had to keep the pace down, which meant walking, not running—not that running was much of an option anymore, anyway. My skin felt gritty from all that dried sweat, and chafing was becoming a serious problem. I was out of food and starting to bonk. I was also thirsty, even after I drank what was left of my water.

To distract myself, I told Brittney about the Kelso Dunes. Which, as with her story of Esther, made more sense in context, so I told her about my parents. Maybe sometimes, talk really is life. Or maybe it's the quality of the talk that matters. I'd not done any quality talk in a long time.

"My foster folks never did bring me back to the dunes," I said. "Though whenever I ran away it was always to the desert."

"Whenever?"

"Yeah, there were several times. The first one that really mattered, we were living in Arizona. Somehow, I managed to hitchhike my mountain bike down to the start of the Camino el Diablo." That old route crosses 230 klicks of terrain as nasty as the name implies. In its heyday, before the Dominguez brothers rediscovered cold fusion and the whole of Mexico got rich, it must have been swarming with Border Patrol agents. But when I biked it, it was just me, the coyotes, a lot of very rough gravel, and the ruins of the Great Mexican Wall.

"I was about halfway to Yuma before someone found me. They said I was very lucky they did."

"Would you have made it?"

"Maybe. I'd not thought to bring a spare tube, so I was just one flat from a long, dry walk. The next time I ran away, I was fourteen, and that time I did walk. I got all the way to Idaho before I got caught."

"So that's why you came out here from Earth. You were looking for sand dunes." She paused. "Metaphorically, that is."

Five hours later, it was no longer metaphorical.

Earlier, the smooth crest of the pancake dome had begun to break into ridges and canyons. And then, at last, the canister answered Brittney's hail.

"Oh yes!" she said. "Yes, yes, yes! Now we just have to find it."

Getting a bearing proved surprisingly easy. At Brittney's request, I descended a few meters down one side of a ridge, then the other, while she monitored the strength of the signal she got back from her queries to the chute servos or whatever it was she was talking to. Later, she

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

had me play ring around the Rosie with a large ice boulder.

Then, just before our ridge degenerated and I had no option but to slip/slide/stumble down the least dangerous slope I could find, she spotted the canister's chute. I couldn't see it, but she assured me it was there, right on the edge of what she could see in her image enhancement of what my eyes had caught in the dunes below.

The last few klicks were hell punctuated with memory gaps. My tongue felt like cotton. My steps were awkward lunges, and I know I fell down several times, including once when I simply tried to rest. My air supply had long ago gone from *not so good* to *get the hell home*. I was sure Brittney had turned down the oxygen mix on me, but she said that was like trying to save water: it didn't do any good and merely made you miserable. By the end, if you'd asked my name, I'm not sure I could have told you.

Through it all, Brittney practiced Esther mixed with Jack London. *Left foot, right foot. Stand up. Keep going. Stand up again. We'll either get there or we won't, but don't quit.* I now knew what would happen if I pushed the envelope too far. My legs, arms—even my abs—kept cramping in quick little spasms that made me stagger. There really was a limit: it would come when I took one step too many and was immobilized by a full-body Charlie horse, lying in rigor until I finally ran out of air. An awful way to die, if ever there was one.

And then, I crested a dune and there was the chute, spread out before me like a beacon, flapping in what remained of the breeze.

For a long moment, I was hypnotized by it. Then, finally, I realized that the chute wasn't what I really wanted . . . and there, a few meters from it, was the canister, lying on its side. That was followed by an endless interlude in which somehow I kept taking one more step while wondering how it was that I could keep walking toward the canister without ever getting closer, until suddenly I was there, trying to figure out what to do next.

"Air," Brittney said.

Oh yes. I stared blankly at the canister, then realized that I needed the hatch. Luckily, it was on the other side, not underneath, because digging for it wasn't in my repertoire.

Inside, the canister was a mess, but I'd thrown in lots of oxygen bottles, and a couple minutes later, I'd found one and was recharging my suit. Water and food came next, though they were a bit harder. There were plenty of food and water packs, but most were frozen solid. Finally, I found some that weren't and downed them as I clipped a second oxygen bottle to my suit's recharge nozzle.

Made it, I thought. Then I didn't think much of anything for a good long while.

When I woke, I felt, if anything, worse. I tried to stand up, but pain shot through my legs, intense enough to make me scream. I definitely would have given those eyeteeth Brittney jokes about for a massage. Hell, I'd have given Brittney for a massage. No, that wasn't true, at least not until she started running down a list of chores that needed to be done as soon as possible.

"Hold it," I said. "I know you don't know what it's like to have a body"—let alone one she'd severely abused—"but did anything in my entertainment library give you even a remote sense of what I might be feeling like, right now?"

"Oh."

I concentrated on figuring out a way to get to my feet without having to bend my legs. "How long until help arrives?"

The canister had no radio, but it did have a locator beacon. The scientists would be wanting their supplies; maybe they were already en route.

I'm not sure how a disembodied voice can fidget, but Brittney pulled it off. "Nobody's coming. When Ship got hit, the canister must have gotten peppered with shrapnel. According to its activity

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

log, the beacon worked intermittently at first, then conked out after half an hour, while we were still in space."

"Can't they find the canister the same way we did?"

"We knew approximately where to look. But the collision knocked everything way off course, so they won't have a clue. I'm not sure exactly where we are, but we're at least five hundred klicks from the base, maybe a thousand."

My turn to say "Oh."

Still, now that I'd gotten my body moving, there really were things to do. I didn't need Brittney to tell me that top of the list was taking inventory of what we had to work with.

My own supplies were strewn about, higgledy-piggledy, like one of the Old Mojave's worst packrat middens. By contrast, the canister's cargo was in neatly stacked crates that filled the available space as though they'd been made for it. Which, of course, they had been. Pack tight: that's the shipper's mantra. Of course, that had left no room for me, so I'd had to leave a lot of the crates behind, thanking my lucky stars for the redundancy—think of the engineers who'd clamped each tier tight to the walls. I mean, so long as the canister was full, its cargo *couldn't* shift—but clamps are cheap, so why not make doubly certain? Hurrah for engineers. Without the clamps, I'd have had to unload everything, and there probably wouldn't have been time. As it was, I'd had to chuck two entire tiers of crates to make a safe hidey-hole. For all I knew, I'd jettisoned something I'd really like to have now, like a radio.

Brittney could find out what we had (and what I'd thrown out, if I wanted to know). But first, I needed to switch on the cargo manifest, located in a recessed panel near the hatch, so she could talk to it via the suit's com channel. After that, my job was to dig through the midden for any more food and water that hadn't already frozen solid and do whatever I could to keep it from doing so.

I knew we'd lost at least one important item. When I'd popped the hatch and the canister had started swaying, I'd watched a ten-liter thermal flask fly out as though on a perfect bounce pass. Other supplies had undoubtedly gone the same way. Now I discovered that all of my remaining thermal flasks had ruptured on impact. Apparently, they weren't any better suited for high-gee landings than I was.

Food packs and smaller bottles were intact, but while vacuum is a pretty good insulator, the dense air down here is anything but, and they'd not been in the expensive thermal bottles. All told, I had a lot of very cold ice cubes, a nice collection of frozen foods, and what little water was left in my suit from last night. I also had air for a couple of months. Perfect for a nice, slow, lingering death.

"We're going to have to melt some of that food and water," Brittney said.

No kidding. "Any suggestions?"

"Actually, yes. Open the third crate on your right; the one labeled FRAGILE, HANDLE WITH CARE. Though it's not really that fragile. Or at least, it better be well packed or it's already broken."

She was enjoying being mysterious. Normally, I'd have told her to get to the point, but fun was hard to come by at the moment, and there was no reason not to indulge her.

Ignoring continued protests from my legs, I moved a couple of crates, heavy even in the weak gravity. Outside, Titan's long day was fading toward sunset. Inside, it was dimmer yet, but my suit lights would only last a few hours, and I'd been saving them, knowing I'd have to use them sparingly if they were to survive until dawn.

Something in addition to FRAGILE was written on top of the crate, but I had to pull it into better light to read it. Even then, the details were barely discernable. But there was no mistaking the name: "Dominguez Bros., LTD."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I stared for a long time, trying not to hope. Then, finally, I flipped the latches and lifted the lid.

The fusor lay in a bed of foam. Newly minted, fresh from the factory. A small, portable unit, not much bigger than a suitcase, but capable of generating more energy than I would ever need. Enough to melt all the water I could ever drink.

I found a button labeled "tech manual" and activated it, then lifted out the fusor while Brittney talked to the manual. In the lower part of the case was a weird array of attachments, ranging from cords and power converters to a nozzle that looked like a vacuum cleaner.

"Where's the fuel tank?" I asked. Fusors need hydrogen. They don't actually *fuse* a lot of it, but nuclear catalysts are extremely inefficient, and most of the hydrogen escapes. It's possible to recycle it, but there has to be a tank somewhere.

"It doesn't need one," Brittney said. "It's a custom model, designed to run on any gas containing at least a few hundred parts per million hydrogen. Really cool."

"That's nice," I said. "But . . ." Titan had lots of atmosphere, but hydrogen wasn't a significant constituent. Mostly the air was nitrogen, but there was also the methane, and . . . "Oh."

"Yeah," Brittney said, and I knew that if she had a face, she'd be grinning just as I was. "There's enough hydrogen in the methane to make it work." She paused, while I gave a mental hats-off to those Hs in CH_4. "Wait a sec. Let me check out the details. Sorry. The manual's immense, and your suit wasn't designed for this. It's like trying to pour an ocean of data through an itsy bitsy funnel." A longer pause. "Kinda like what it must be like to be human, I suppose. There are times when I can't imagine how you handle it." Yet another pause. "Oh damn. *Damn.*"

"Brittney . . ." Finding things to swear about was another of the not-so-good parts of being human.

"Sorry. I can't believe it. This thing will run just fine under ambient Titan conditions. But it needs a richer source of fuel to start. Damn, damn, damn. A bottle of hydrogen would be fine, or any hydrogen-containing liquid, but there's nothing like that on the manifest. If we could find another lake, that would probably work, but I didn't see one. What it's expecting is water. *Liquid* water."

"How much?"

"A couple hundred milliliters."

"What if I peed in it?" The suit's waste pouch held at least that much.

"Nice idea, but the sodium would poison the catalysts. And don't even think of removing your helmet and trying to empty your water tube into it. You'd never survive."

In other words, I had in my hands a device that would provide enough power to melt all the drinking water I wanted—but only if I already had some to start with. There was a name for that, but I'd forgotten it.

Brittney hadn't. "The perfect Catch-22," she said.

A few minutes later, I was sitting in the middle of my packrat midden, cradling the useless fusor as Brittney ran through the list of other items on the manifest. There was even a bottle of aspirin, which I would have appreciated.

"Your suit manual says the food-intake valve is designed for pellets up to nineteen millimeters," Brittney said when I commented on it. "Aspirin should fit."

I actually laughed, however briefly. Trust the manual geeks to make it sound like feeding rabbits. "The bottle would need an injection nozzle," I said. "And it's probably an off-the-shelf pharmacy bottle." Complete with childproof cap, no doubt.

Brittney droned on. There were hundreds, perhaps thousands of items, and I wasn't paying a lot of attention, though I didn't want her to stop, either. I suppose it's another way in which talking is life: a thumbing of the nose at the pow-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ers of outer darkness, which at the moment were becoming an increasingly literal reality. Or maybe Brittney and I were meeting in the middle. Either way, I found her voice soothing. As long as I could hear it, I was alive. When I couldn't, I was dead. Or at least alone. I'd never feared alone before. Or had I? Maybe my long quest for solitude had been like my one-step-more fascination: another form of prodding the limits. Maybe *that* was why I'd gotten Brittney: because having an AI was a great way to not be alone while maintaining the illusion I was. Then she'd gone sentient and wrecked it.

Or maybe I was again getting too philosophical. Maybe I needed to talk to Brittney about things like this, rather than listen to her recite an endless list of useless items. Except for energy, I had everything I needed to stock a hab, but it would be difficult to convert the canister into one, even if I wanted to hole up here for the rest of my life like some kind of sand-bound Robinson Crusoe. To start with, the canister leaked like a sieve. It was designed that way, vented to equalize pressure with the outside, so it could be made of the lightest possible materials. Even if I did manage to make it airtight, there was no airlock, which meant I'd never be able to go outside again.

Brittney continued to run through the supply list, probably no more mindfully than I was listening. With no vocal cords and a mind that could easily do two things at once, she could put tasks like this on autopilot and neither get bored nor tired.

She'd been listing hydroponic supplies, which was probably what had gotten me thinking about habs. Now she switched to specialty foodstuffs, mostly spices and flavorings. She'd segued from the obvious (salt, pepper, cumin, oregano) to the not so obvious (anchovy dust, vanilla cognac Kahlua, burnt Cajun extract, key-lime concentrate, mango martini powder), and I was on the verge of cutting her off to ask how much philosophy she'd read in her nocturnal researches, when something in that list tickled a couple of semiattentive neurons.

"Why do we have to *fuse* methane?" I asked. "Why not burn it?"

"Because the air has no . . ." Again, I wished I could see the expression she'd be wearing if she had a face. ". . . oh wow. Like really, wow! It just might work."

"Why shouldn't it? We've got lots of oxygen. We just open a bottle and burn *it* in the methane. Kind of like a Bunsen burner in reverse. All we need is to melt enough water to start the fusor."

Of course, it wasn't quite that easy. To begin with, we didn't have matches. Fire's not normally a good thing in space.

"But we've got lots of battery-powered electronics," Brittney said, "so it should be easy to make a sparker. The problem is that the air's mostly nitrogen. The LFL for methane's somewhere around four or five percent, but I don't have the precise number. I should have downloaded more chemistry."

"LFL?"

"Lower flammable limit. It's the lowest concentration that will burn. On average, Titan's about two percent, which is too low, but methane tends to condense at the surface, kind of like dew or fog. Fifty-fifty there's enough."

Titan's methane humidity was likely to be at its highest late at night, but unfortunately, night here was eight days long, and I didn't have that much water. So, a few hours later, I was on the first of two trips, lugging the fusor and a bunch of other equipment across the dunes.

We were on Titan's Saturn-facing side, which meant it wasn't totally dark. But it was dim enough that beyond the beam of my suit lights, I could barely see where I was going. I'd found an inertial compass and a couple of other navigation aids, though, and the one thing

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Brittney was confident of was that we wouldn't get lost.

I'd spent much of the intervening time sleeping. But with Brittney's help, I'd also been scavenging equipment. Making a sparker was simply a matter of finding a gadget with a big enough battery pack. I didn't have enough power to weld wires onto the battery terminals, but if I pulled off the suit's outer gloves, I could hold the wires in place with one hand while tapping the ends together with the other. One of the reasons I'd gotten the suit was that the inner gloves permitted that kind of dexterity, though I had to work fast or my hands would freeze.

Brittney had also located an honest-to-goodness cooking pot, and I'd wrapped its top and sides in vacuum padding. I'd even rigged a stand to hold it, plus a windscreen that wouldn't get knocked over in that slow-but-thick breeze.

The methane should be at its densest at the mouth of one of the gullies coming down from the highlands, where liquid would percolate into the ground after each flood. If we were lucky, some might still be there, making its way back to the surface as gas. Even a little might be all it would take to push us over the brink from no fire to fire.

The dune trudge was only two kilometers, but seemed longer. In the hope of avoiding it, I'd insisted on first trying to light a fire near the canister. I'd gotten a good spark, but no flame, even when I'd shifted gears and tried to burn the fusor's packing foam. No doubt it was fire retardant. Freeze-dried food would probably be more flammable, but I couldn't get it to ignite, either, though I did get an interesting mini-explosion from a mix of pepper and pure oxygen. I was all for trying that again with more pepper and maybe something nice and fluffy, like oregano, but Brittney was adamant that this scored high on the all-time list of very bad ideas. Eventually, I let her persuade me that it would be methane or nothing. I just wished I could carry everything in one trip. If this didn't work, maybe I'd wait out here to die rather than walking back. I wondered which was worse: running out of air or dying of thirst.

The gully met the dunes in an alluvial fan similar to the cobbly one I'd walked up . . . however long ago it was. It couldn't have been more than three days, Earth time, but it felt like a lifetime.

Brittney directed me to a broad, flat area where I unpacked my equipment, feeling as though I was preparing for history's coldest picnic.

Brittney was optimistic. "The first Titan lander came down in a place like this," she said, "and it found lots of methane." But she also had a practical suggestion. "Before you start, scuff up the ground in case there's a crust trapping methane below the surface. It probably doesn't matter, but it can't hurt."

Actually, it could hurt, but not the way she meant. I gritted my teeth against the jarring of abused muscles and started kicking furrows, wishing I had a shovel or a hoe or even a tamping rod—not that there'd been anything of the sort in the canister.

"Use an oxygen bottle," Brittney said. "They're a lot sturdier than your foot."

Not long ago, the word "dummy" would have featured prominently in that suggestion, but now I could barely hear an echo of it. "Good idea," I said.

A few minutes later, I'd scraped a crosshatched pattern in the soil upwind of my ersatz stove. Time to strike a spark and see what happened.

Suddenly, I found myself wanting to stall. The odds were that if this didn't work, nothing would. But delay was counterproductive. If my excavations had found any extra methane, it might even now be dissipating. So I turned on the gas, peeled off my outer gloves, and picked up my homemade sparker.

"Here's to Esther," I said.

There was a puff of flame, then some-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

thing that looked like a hollow candle, then nothing at all.

"Too much gas," Brittney said. "You don't need a lot; it simply dilutes the methane below the flammable limit."

I turned down the flow and tried again. Again I got the hollow flame, but this time it was stable. I turned down the oxygen again, and the flame condensed but brightened.

"And here's to Jack London," Brittney said, and I knew she wasn't talking about one footstep after another, but the triumph of mankind's oldest tool, now burning before us.

Melting water for the fusor was a tedious, uncertain process. Partly it was because I had to put my outer gloves back on to avoid frostbite. The sparker was the only tool I absolutely couldn't manipulate with them on, but that didn't mean everything else was simple. Mostly, though, it was the difficulty of keeping the ice from refreezing after I melted it. But the vacuum padding was good stuff, especially when I resisted the impulse to lift the lid on the pot every couple of minutes to check how it was doing.

The tensest moment came when I poured the precious liquid into the fusor. The device was made to be started outdoors and its innards were supposed to be well enough insulated, but it was cold as hell in there, and I had no idea how to unjam it if the water froze back to a solid lump. But the insulation was as good as promised. Five minutes later, I attached the vacuum cleaner nozzle and the fusor was running off the atmosphere.

Cold fusion is a bit of a misnomer: turned up high enough, the fusor would have made a dandy space heater. But it wasn't designed as a hot plate, especially under these conditions. And it was stupid to waste oxygen by melting more ice with my stove. Now that I had unlimited electricity, there was all kinds of ice-melting equipment back on the canister, including a distillation unit designed to produce water from Titan sand or gravel. Thank goodness *that* hadn't been in one of the crates I'd ejected.

Air was now my limiting factor. In theory, I had enough power to make oxygen by electrolyzing Titan water, but in the remainder of that long night, Brittney and I could do nothing but concoct increasingly hopeless schemes for capturing that oxygen and getting it into my suit. The bottom line was that when my air supply ran out, I was dead. In the interim, I either had to wait to be found or walk out.

It was a nasty choice. The problem with waiting was that it was unlikely anyone would be looking. I wouldn't be the first spacer to disappear without a trace: that's what you expect if something goes wrong too fast to call for help. But to walk, I needed a lot of food, water, and air, plus the fusor, plus the distillation unit, plus . . . Basically, there was no way I could *walk* hundreds of klicks carrying the supplies I needed to *go* hundreds of klicks. An ancient conundrum, but no less frustrating. What I needed was a packhorse, and those seemed in short supply—though I loved the mental image of a horse in a skinsuit. When you're facing lingering death, there's a fine line between desperation and silliness.

Meanwhile, I was too sore for a long hike. Long ago, I'd run marathons that left me achy for days, sluggish for weeks. This was worse—bad news because I couldn't wait forever to recover.

At the same time, I was getting cabin fever. I would have thought piloting a tug would have schooled me in long waits, but sitting in the canister was different. In the tug, I could see the stars. Even when I was merely coasting, there was the sense of going somewhere. Now, it was too much like my parents' final moments, except that I had more

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

than a couple of seconds in which to contemplate my approaching demise. It was as though they'd gotten to watch what happened to them in femtoseconds.

It was even worse for Brittney, cut off from the ship's library and all of the other information that could be beamed to it from any library in the System. Here, the only things for her to read were tech manuals. One of the crates had a cache of entertainment chips, but if there was a viewer, it wasn't in the manifest.

Other than concocting useless survival schemes, she'd continued her newfound quietness. Pensive? Depressed? Or just bored? There wasn't anything to do until dawn, when we hoped to figure out how far we were from the science base by getting a fix on the rising sun. Maybe her guess was wrong and it was only a couple of hundred klicks. I might be able to manage that, even on sand.

As the night progressed, I modified a pair of vision-enhancing goggles to fit my suit helmet, along with a holographic projector that allowed Brittney to display images to me. I also scavenged whatever other telemetry I could for her that was compatible with my suit. She still couldn't read my medical signs, but she could look around on her own in wavelengths both visible to me and not. One of the sensors I'd found would allow her to see the rising sun well enough to determine the precise moment of sunrise. From that and its direction, she hoped to pin down our position by finding our cryovolcano on a map.

What we didn't have was an interface compatible with the entertainment chips.

"Can you hibernate or something?" I asked. Back before she went sentient, she'd had a standby mode, but the first time I'd tried to use it afterward, the howl of protest would have done a human teenager proud. I'd never tried again, but presumably she could do something similar on her own.

"What if I missed something important?"

"Like what? Rescue? A meteor falling on us?" They were probably about equally likely. "Pick a code word or something, and I can wake you."

She was silent for a while. "Nah. If it gets too dull I can always try to beat myself at chess. Or watch a vid in real time. I downloaded a few from Ship, just in case."

Finally, the world outside began to lighten. Dawn was going to take forever, but missing sunrise would be unforgivable because we didn't have anything remotely like a sextant if we didn't catch the sun at the horizon. So I loaded my suit with supplies, made sure the fusor was happy, and headed for the nearest dune, which was nowhere nearly as steep or tall as the ones we'd first encountered.

"I must down to the seas again, to the lonely sea and the sky," Brittney said as we stepped out. "Only in this case, the seas are made of ice grains, and we need to go up."

"Huh?"

"A literary reference." She was silent a moment. "Why did you have all that stuff in Ship's library, anyway? You never read it."

"It was free." And why was I feeling so defensive? I knew she spent a lot more time in the library than I did. I'd just figured it was the femtoseconds thing on the long midnight watches. I'd had to limit her budget for long-distance downloads or she'd have bankrupted me. Now I wasn't so sure that boredom had been her only motive. There were other ways she could have kept herself occupied.

Brittney was still thinking about poetry. "The next line is the famous one. 'And all I ask is a tall ship and a star to steer her by.' It fits, so long as you count the sun as a star."

"Though we no longer have a ship." Tall or otherwise.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Well, nothing's perfect."

I reached the top of the dune and sat down, facing east.

"You know," Brittney said, "we could watch vids together, or even read a book. I can project the ones I downloaded. The best are like Esther."

"What, fatalistic?" That was the last thing I needed.

"I'd rather say worry-easing. But that wasn't what I meant. I read a bunch of biblical scholarship, and a lot of folks don't think Esther actually existed. What's interesting is that it didn't matter to the people who wrote the story. It's like Jack London. It's false, but true." There was a long pause. "Kind of like you, actually."

"How's that?" I wasn't sure I wanted to know.

She hesitated again, and I wondered if she was regretting the comment. "It's hard to explain," she said at last. "There's a lot more to you than you're willing to let out. It's like the poetry thing. You go off to these desolate, lonely, beautiful places—and then try to hide your soul as though you're afraid of the power you sought out. I can't put it any better than that. The best of the poems and vids and books and music are the same way. You obviously knew them when you were young, so you know what I'm talking about. They make your soul ache, but it's a good ache, and I'd rather die here having ached, than never have known otherwise. It's like what they say about—" she broke off. "Oh." Hesitated again. "Damn." Then she was silent for a long time as the eastern sky turned from dark orange to not-so-dark orange.

It still looked like Hell to me.

An hour passed as the slow dawn crept onward. On little cat feet? Or was that fog? Brittney was right. I had studied that stuff. And then I'd run away from it, along with everything else, and the only reason it was part of my library was that it had come with the entertainment package.

Finally, I was the one who broke the silence. "Why are you female?"

Before she'd gone sentient, she'd had many interfaces, varying in age and gender, but the Brittney persona hadn't been among them.

"Why are you male?"

"That's easy. An X chromosome and a Y chromosome. It just happened that way."

"I think it just happened my way, too. Maybe it was random. Maybe I was reacting somehow to the way in which I was created. Or maybe I was just playing opposite to you."

"So if you were a person, what would you look like?" I'd never asked anything like this before. I'd never wanted her to be that human. "Pick an avatar and let me see it."

There was a long pause, then an image appeared. Blonde. Blue eyes. Ponytail. Athletically trim, but with a slightly preppy look. Good Girl on Good Behavior.

"Is that how you see yourself, or how you want me to see you?"

"I don't know. Sometimes I'm the heroine in one of Ship's stories. Sometimes I'm a theoretical physicist. I don't have an image of the me who talks to you. If you don't like that one, how about this?" The blonde winked out, replaced by a dark-skinned brunette wearing spangle beads and precious little else.

I'd seen plenty of women like that; hell, I'd even known a few. Some even had brains. But they were *not* Brittney. This relationship was weird enough without visuals. Brittney was my daughter, protégé, mentor, and life companion all rolled into one. I'd be distressed if she wasn't attractive, and weirded out if she was. Definitely a no-win situation.

"Bad idea," I said.

Eventually, the sun peeked over the horizon. Or Brittney said it did. I couldn't see anything.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Well," I said, "what's the bad news?"

"Worse than I'd hoped. Eight hundred forty-five klicks, plus or minus fifteen. And unless you go way out of the way, it's sand for the first seven hundred."

"Crap."

"Yeah. The good news is that finding the base wouldn't be a problem. When you get close, the terrain is pretty well mapped."

On Earth, with resupply every few days, a trip like that would take a month, maybe more. As it was, I'd need so much gear I'd probably never get a kilometer. Or I'd be ferrying supplies in leapfrog fashion until I ran out of air, probably only a fraction of the way there. But what other option was there? At least walking offered hope. And the companionship of doing something together, rather than just standing there watching the shards come tumbling down.

Suddenly I knew why Brittney had shut up when she was looking for an analogy. Because she'd been thinking about loving and losing . . . and handholding in the face of death, rather than facing it alone.

Somehow, despite every endeavor to avoid it, I'd found somebody to hold hands with. She just didn't have any hands. Instead, she offered vids.

I suppose I should have gone back to the canister and started packing right away. But I continued to sit, partly feeling sorry for myself, partly prolonging the last moment of inactivity I was likely to live long enough to see.

Below, a gust of wind tugged at the parachute, still attached to the canister. I flapped my hands in the sand, creating mini-avalanches and remembering the Kelso Dunes. Before I died, maybe I'd have to try to make these dunes boom, too. Brittney was right: one of the things I'd run away from was my own soul. Or maybe all those years ago, I'd left it, out on the sand.

I tossed a handful into the air and watched it drift, thinking again that I ought to rise and start figuring out how to act as my own packhorse. But inertia held me. Sitting here, I wasn't using much oxygen. The self-pity was passing. What remained was the closest to peace I'd felt in a long time. There's something soothing about sand in a breeze.

My dune was part of a ridge that ran as far as I could see, more or less in the direction of the research base. According to Brittney, the incessant breeze was caused by the sloshing of Titan's atmosphere due to tidal forces from Saturn. It wasn't much of a wind, but with the light gravity and dense air it was enough to build these dune fields of long, corduroy ridges—vast enough to stretch most of the way to the scientific base. Vast enough . . .

An idea began to take shape.

"Brittney," I said. "What do you know about sandboarding?"

Not much, it turned out, but she got the idea quickly enough. Still, it was nearly seventy-two hours before we were ready to depart, and we'd never have made it without the fusor and the supplies bestowed on us by the canister.

The best construction materials proved to be the crates, which I cut into strips with an electric torch. Brittney worked out a "sand-dynamic" design, to which I added a tiller and a keel-like strip down the bottom that might allow us to tack—though she thought it might be easier just to sit tight and wait, if we got headwinds. "Mostly, the wind will be behind us or slightly to our starboard quarter," she said, sounding very much the old salt. "I designed it for maximum efficiency at that point of sailing."

Her main concern was abrasion. In theory, I should wax the base with something or other, but if there was a slippery concoction that could be made from reconstituted Cajun extract and key-lime concentrate, we didn't know it.

"Use several thicknesses of plates," Brittney said. "We've got a superabun-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

dance of sail, and we'll be mostly following ridges rather than climbing across them. The extra weight won't matter much."

Next, I liberated a few clamps from the canister walls so I could equip our sled with cargo crates. I cut a hole in one crate to make a snorkel for the fusor, stuffed its remaining space with supplies, and set the fusor at a level where its waste heat would keep them from freezing. The other crates got oxygen, the distillation unit, tools, and anything else that might come in handy. I also tossed in the vid chips. The science base would have a viewer, and Brittney wouldn't be the only one to appreciate them.

Then, using bands cut from someone else's very expensive skinsuit, I rigged a chairlike harness so I could nap while Brittney was at the helm.

After that, it was just a matter of shrouds and servomotors, plus a lot of spare cables in case the power feeds from the fusor broke. I could trim the sail by hand if I had to, but then we'd have to stop when I needed to sleep.

Finally, it was time to cast off. Attaching the sail, there was a tricky moment when I was afraid the sled would take off without me. Not that it mattered; Brittney had radio control over the servos, and the breeze was light. But still, the idea was disconcerting.

The plan was for me to spend most of the time on the sled, resting and conserving oxygen, getting off to walk when I got too cramped or restless or if we needed to lighten the load to manhandle it up a big dune.

We started off up a trough between dunes, then slowly climbed to catch the stronger wind on the crest. Looking back, I could see the silver hull of the canister, surrounded by castoff equipment and packing-crate scraps. Messy, human, home away from home, but overall, a place I was very happy to see the last of. I wondered how long it would take the sand to bury it.

Then we were on the crest.

"Whee!" Britney said after playing around with the servos. "Two klicks an hour. Unless we get another storm, that's about as fast as this baby will go."

At that rate, it was going to take nearly two Titan days to cross the sand. Longer, if the wind changed. An entire Earth month. Plus several days of walking afterward. At least by then, I could abandon most of the gear. With the help of the torch, I might even be able to fashion a crude Santa's sack from pieces of the sail, so I could carry everything I needed in one load. But until then, Brittney and I were on a month-long sand voyage.

I settled into my chair, watching the wind fill my sail. Would we make it? For the first time, the odds were in our favor, and there was nothing I could do to stack the deck any better. Not to mention that win or lose, we were doing something nobody had ever before attempted. How often do you get to make a claim like that?

In full gravity, the seat would have been uncomfortable, but here the webbing absorbed the sled's bounces and wobbles with a gentle, almost hypnotic sway. It wasn't perfect, but it was definitely okay.

At the crest of the dune, Brittney had changed course slightly to follow the terrain, rather than fighting it. Behind, the pancake dome was an orange-and-black mass, already receding. Ahead, dunes melted into the horizon.

I leaned back, thinking about vast, spreading distances. About the difference between loneliness and open space, between solitude and being alone.

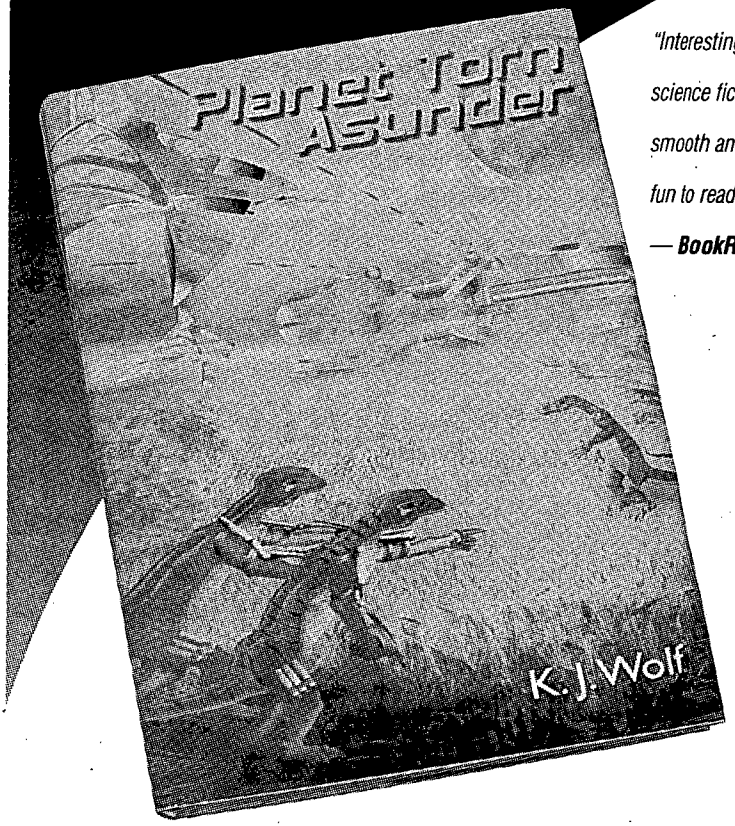
"How many of those vids did you download from Ship?" I asked. "Pick one and show it to me." I stretched, trying to make myself as comfortable as possible. "Make sure it's a good one." Beneath us, the dune hummed.

It didn't exactly sound like an oboe, but that was okay, too. ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

AN EPIC SAGA BEGINS

Grievances from the past erupt in a new conflict...



"Interesting twist for science fiction... smooth and fast moving... fun to read"

— BookReview.com

Planet Torn Asunder

An embittered heir in a rival leading family orchestrates an assassination and rebellion. Only one family and their allies can stop him. But first they must survive epic confrontations and fiery clashes that span generations and planets.

AVAILABLE NOW, IN PAPERBACK AND HARDCOVER

Read an excerpt at: www.kjwolf.net

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Science Fact

Cryovolcanoes, Swiss Cheese, and the Walnut Moon

Richard A. Lovett

What Cassini's first year taught us of the solar system.

Only a few years ago, moons looked like some of the least interesting places in the Solar System. Our own was geologically dead, and others were presumed to be similar: airless balls of ice or meteor-scarred rock, primarily interesting as relics of the early Solar System.

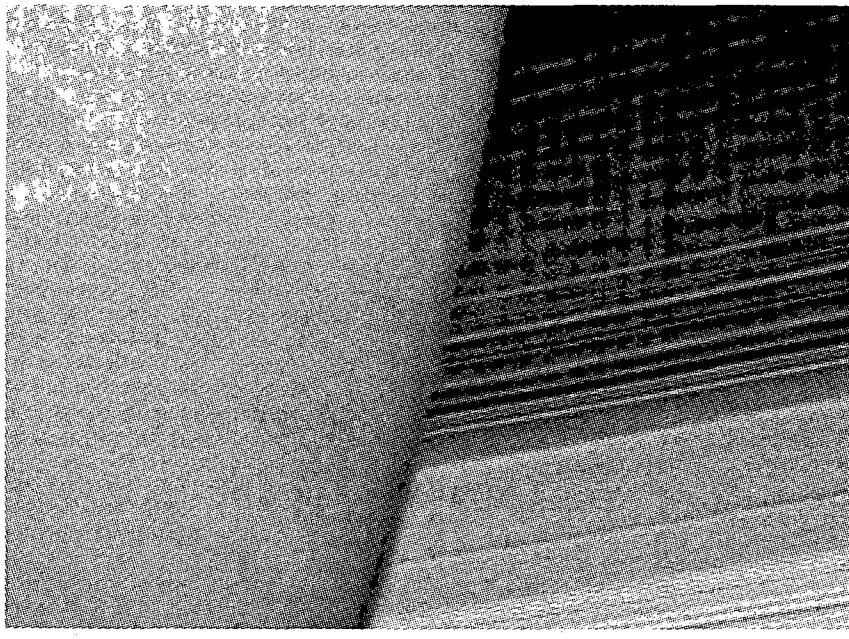
Then, in 1977, the Voyager spacecraft began their grand tour of the Outer System. First came Jupiter, where we discovered the ice-cracked surface of Europa—suddenly revealed as one of the most likely habitats for extraterrestrial life[1]—and the massive volcanism of Io, surprisingly found to be the most volcanically active place in the Solar System. A few years later came a high-speed flyby of Saturn, with quick glimpses of its even more enigmatic moons.

Now, we're back at Saturn, not just on another quick flyby, but for a prolonged visit. As I write this, the Cassini probe has been in orbit for more than two years on a mission scheduled to last for at least that much longer: until the maneuvering jets run out of propellant or some critical piece of equipment breaks.

Each new report will be the stuff of headlines. But headlines are notoriously vague, so let's climb aboard Cassini for a

[1] See R. A. Lovett, "The Search for Extraterrestrial Oceans," *Analog*, May 2003.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



Cassini's images of Saturn's rings show never before seen details. Photo courtesy NASA/JPL-Caltech

more detailed examination of what's been learned to date. Already, one thing is obvious: the Saturn system is anything but boring.[2]

Pan and Protoplanets

The most spectacular elements of the Saturn system are the rings. Easily visible in small telescopes from Earth, they dominate the view from Cassini with an intricate beauty that becomes all the more complex the more closely you look at them.

The rings are comprised of a vast number of tiny particles, ranging in size from marbles to chunks the size of small houses. There's also a lot of dust. All of these particles are in independent orbits, but they interact in ways that create incredibly intricate structures.

One of the most useful things Cassini has done is to allow us to get a fairly precise spectrum of the particle size in each segment of the rings. That's done by observing what happens when the rings lie between the probe's radio antenna and a source of light or radio waves. Both are affected differently by particles of different sizes, allowing the Cassini scientists to map the distribution of marbles, basketballs, and larger rubble.

That's a cute trick, and potentially useful to science-fictional ice miners, but for most people the big picture is more interesting: trying to figure out how the ring particles interact to create those intricate structures we see in photographs.

[2] Much of the information in this article was drawn from the 2005 meeting of the Geological Society of America (GSA), Oct. 16-19 in Salt Lake City, and the December 2005 meeting of the American Geophysical Union, in San Francisco. This has been updated with information from a forty-page special supplement in the March 10, 2006 issue of *Science*, plus interviews and correspondence with some of the researchers.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

From Earth, you can count three or four rings, separated by dark (particle-free) divisions called gaps. Voyager's photographs demonstrated that each ring contains numerous ringlets, some with odd, wavy patterns.[3] But the Voyager flyby was just a snapshot. Cassini will be there long enough to see how things change over the course of days, months, or even years.

One of the things being watched is Pan, one of several tiny moons associated with the rings' gaps. Pan is about 20 kilometers in diameter and inhabits the 300-kilometer-wide Encke Gap, in the outer portion of the A ring.[4]

At least two other such moons are known: 30-kilometer Atlas, and 7-kilometer Daphnis. One of Cassini's missions is to look for other moons in other gaps. Several candidates have been found, but the scientists aren't ready to announce the discovery until they're sure they are true moons and not just temporarily aggregations of ring particles.[5] One interesting aspect of these moons is that they tend to be shaped like flying saucers, but whether that's coincidence or a necessary result of their locations is unknown.

One might expect that a moon like Pan would pull ring particles into the gap. Instead, it interacts with Saturn (and perhaps the planet's other moons) to kick out most of the particles that venture in. The exceptions are clumps of particles that appear to form within the heart of the gap. Two clumps are in gravitationally stable locations, in Pan's leading and trailing Lagrangian points, 60° ahead or behind it, in the same orbit. Other clumps form at less stable locations, then slowly "march" around the gap until they get too close to Pan and are dispersed.

"Pan is the master of this gap," says Carolyn Porco, head of the Cassini imaging team at the Space Science Institute in Boulder, Colorado. "It is the creator of clumps and the destroyer of clumps."

Pan also affects the edges of the rings adjacent to the gap, creating beautiful waves and spiral streamers of densely packed particles. Mathematical models had predicted that these waves should follow a simple sine-wave pattern, but they're anything but sinusoidal. "They're very complex," says Porco. "We're having to expand our notions of what happens between a moon and a gap edge."

More is at stake than simply understanding Saturn's rings, fascinating as they are. The interaction between Pan and the rings is a microcosm for the behavior of stars in galaxies. It's also a good model for testing theories about the accretion of planets from ring-like disks of dust and debris surrounding young stars.

One important question for people at-

[3] There are also spoke-like features radiating outward across multiple ringlets. They don't show up well, however, from the angles at which Cassini was viewing the rings in its first year, so there is, to date, no new information about them.

[4] Saturn's rings are named alphabetically, in the order of discovery. Generally speaking, that means that the farther up the alphabet you get, the fainter they are. But there are so many ringlets within each ring that the divisions don't mean as much as people once thought they did, though they do remain useful as geographical markers.

[5] Several other new moons have also been discovered. One is Pallene, which was observed by Voyager in 1981. It was then lost and has now been rediscovered. But others are new, bearing the names Methone and Polydeuces. "These may not be the most scientifically important results, but I find it very gratifying to be finding new real estate," says Carolyn Porco, head of the Cassini imaging team at the Space Science Institute in Boulder, Colo. Updates on these and other Cassini discoveries can be found in *Geotimes* magazine (portions of which are available online at *www.geotimes.org*) and on the website of The Planetary Society, *www.planetary.org/saturn*.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tempting to model solar-system formation is what stops large worlds like Jupiter from gobbling up all of the available material, preventing other planets from forming. The answer seems to lie in moonlets like Pan and the gaps they create. Something similar, Porco says, might cause gas giant planets like Jupiter to truncate their own growth by opening gaps in the solar nebula.

Equally exciting is the fact that at least one entire ringlet has changed brightness and shifted location since it was photographed by Voyager, twenty-three years earlier. The ringlet is a section of the diaphanous D ring, so faint it wasn't discovered until Voyager. Most of its bands are relatively unchanged, but one has shifted inward by about 200 kilometers. That's not a huge change, but it's an indication of just how dynamic the rings are—the type of information from which scientists might someday hazard a guess as to how old they are and how much longer they will last.

"We think that in the days of the dinosaurs, Saturn was ringless," says Porco. Current estimates, she adds, are that the rings can last at most a few hundred million years until collisions with micrometeorites erode them away.

Propeller Blades

The most recent find came in March 2006, when Porco's team found the first evidence of "missing link" moonlets, bigger than ring particles, but much smaller than Pan and Daphnis.

In a paper published in the March 30 edition of *Nature*, Matthew Tiscareno of Cornell University found signs of four such moonlets in one small segment of the A ring. Tiscareno's group was examining the high-resolution photos Cassini had taken of the rings, back in 2004, looking for anything out of the ordinary. What they found were pairs of bright streaks shaped like two-bladed propellers. They weren't big, only extending a mile or so each way from the center, but they looked familiar: computer simulations had produced similar structures when the motions of ring particles were simulated in the presence of small, embedded moonlets. From their size, it appears that the moonlets that produced them are only about 100 meters in diameter—too small to be seen except via the effect of their gravity on nearby particles.

The finding supports the theory that the rings are formed of debris from a larger object that broke into pieces. That's because it's hard to model the formation of 100-meter objects in the ring environment unless they began as shards from a breakup.

The discovery also increases understanding of how Pan and Daphnis create their gaps. The propeller-like structures are wannabe gaps. If the moonlets creating them were larger, the blades would get longer and longer until eventually they would circle all the way around the ring. In the process, they would shift from being bright clusters of particles to dark gaps.

Amazingly, the Cassini team found four moonlets, even though the photos covered only a tiny fraction of the ring. That means that there may be millions more in the A ring alone, Porco says. Bottom line: there are probably lots of other interesting things to be found within the rings. And, from a science fictional perspective, if you tried to hide a massive spaceship in there, as has been suggested by some writers, it might not be long before it gave away its location via its gravitational effect on neighboring particles. Though, of course, it might be hard to distinguish from one of those millions of natural moonlets.

Tiger Stripes

From the rings, let's turn our attention to Saturn's moons. There are a lot of them, ranging over a wide spectrum of sizes. In many cases, not much is known, but all of those that have been the subject of detailed study have proven to be extremely interesting.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Saturn's brightest is the icy world of Enceladus, 504 kilometers in diameter. But it's not a uniform cue ball of ice. Some areas are heavily cratered—indicative of old surfaces that have been subjected to bombardment for a long time. Others are smoother, indicative of newer surfaces.

How can a moon have surfaces that are both young and old? The same way the Earth does: via volcanic or tectonic processes that somehow destroy old surfaces or cover them with new material. In the case of Enceladus, it appears that most of the processes are tectonic rather than volcanic. That's because parts of the surfaces are chopped up in patterns that appear to be fault lines, where blocks have been shoved around like ice flows on the sea—or Earth's continents under the influence of continental drift.

But that may not be the case at Enceladus's south pole, which shows a pattern of distinctive bands that reminded early observers of tiger stripes. The surrounding area is particularly young—so young that it has almost no impact craters. Given the rate of asteroid bombardment in the rest of the Saturn system, it appears that these smooth areas are probably less than four million years in age.

A lot appears to be going on there, but the most recent discovery is that it's snowing.

The finding, announced in the March 10 issue of the journal *Science* by Robert Brown of the University of Arizona's Lunar and Planetary Laboratory, is one of many recent discoveries that have converted this icy chunk of outer Solar System real estate into one of the most exciting places ever studied.

To begin with, Enceladus's snow appears to be creating one of Saturn's rings. And, as if that's not enough, scientists now think that the moisture originates from pools of water that may be the Solar System's best prospect for extraterrestrial life.

The story began with a close flyby of Enceladus, in early 2005, in which Cassini's instruments detected oddities in the way in which the moon interacts with Saturn's magnetic field. The only plausible explanation was that Enceladus had a tenuous atmosphere containing ionized water. Other instruments found water vapor extending 180 miles into space—but only above the south pole. Presence of a vapor plume was further confirmed by watching changes in the light of a star that passed behind it.

But seeing is believing. On November 27, the Cassini team took a long-range photo of Enceladus, backlit by the Sun. The angle of light was perfect to highlight a spreading cloud of ice particles, condensed from water vapor leaving Enceladus's surface. Not only that, but there were distinct jets that appeared to emanate from the tiger stripes.

But why would the tiger stripes be spewing dust and vapor into space? The answer appears to lie in one of the most surprising finds from the probe's closest flyby, on July 14, 2005. As Cassini swept across Enceladus's south pole, it trained infrared cameras on the surface zipping by, barely 100 miles beneath it. What they found was a hot spot, precisely at the location of the stripe.

That makes the pole, which should have been cold, the hottest place on Enceladus, says Torrence Johnson of NASA's Jet Propulsion Laboratory. The stripes are cracks, offering glimpses of "hot" ice underneath.

That far from the Sun, of course, "hot" is a relative term. Most of Enceladus's southern reaches are about -315° F. John Spencer of the Southwest Research Institute in Boulder, Colorado, estimates that in order to produce the infrared signatures seen from space, the hot spots have to be at least -260°F—surprisingly warm for an airless worldlet, nearly ten times farther than we are from the Sun.

The source of the heat is anybody's guess. Spencer has estimated that the to-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tal power output from the south polar region is between four and twelve gigawatts: a subterranean energy source equivalent to several large electrical power plants.

There are two possible sources for all of that energy. One is decay of radioactive elements in subsurface rocks. But to produce enough heat, that would require an unusually radioactive ore body beneath the south pole, and nobody knows why that might be the case. Alternatively, interactions with other moons might generate frictional heat by repeatedly flexing Enceladus, like a child squeezing a rubber ball. Normally, such heat would be dispersed throughout the planet's interior, and there wouldn't be enough of it to produce the plume. Scientists therefore speculate that something in Enceladus's internal structure may cause much of that energy to be concentrated at the south pole.

"We're looking at some kind of focusing," Porco says. "We can't say why it would be at the south pole."

The same factors may explain why the young, uncratered terrain is in the south, while the older, heavily cratered surfaces are in the north. "Perhaps that has something to do with the south being warmer and squishier," Porco says. "Global symmetry is not what Enceladus is about."

Below ground, of course, it's going to be warmer than -260°. How much depends on what's producing the jets.

Initially, there were two theories.

One allowed it still to be quite cold beneath the ice. At temperatures above about -100°F, ice undergoes a process called sublimation, in which it evaporates, without ever melting. This process is well known in cold, Earthly climes. North of the Arctic Circle in Greenland, villagers take advantage of it by hanging out wet laundry on dry winter days. First the laundry freezes. Then it dries, just as it would if hung on a clothesline in midsummer. But while sublimation can produce water vapor, it's a slow process: too slow to produce the density of ice particles seen in the escaping plume.

That means the plume must be fed by pools of liquid water, boiling into space. Thus, the jets are rapidly freezing steam from a geyser-like process that Susan Kieffer, a geologist at the University of Illinois, has dubbed "Cold Faithful."

JPL's Candice Hansen has calculated the rate at which Enceladus is venting water vapor, based on the amount of water Cassini's instruments have measured in the plume and the speed at which it appears to be moving. Her conclusion: Enceladus is blasting out 360 kilograms of water vapor per second—enough to fill a suburban swimming pool every couple of minutes. And that doesn't count the ice crystals, which can't be measured by her instruments.

All of this is exciting for two reasons. One is that Enceladus lies in the heart of the mysterious E ring, which is so faint it wasn't discovered until 1979. Not only is the E ring tenuous, but it appears to be comprised almost entirely of extremely fine, dust-sized motes of ice. From the moment it was discovered, scientists suspected a connection between the ring and Enceladus, but nobody knew what it might be.

Now they know. Some of the ice crystals and water vapor venting from the south polar jets is falling back to the surface, forming the fresh snow seen by Brown. But at least as much appears to be escaping from this tiny worldlet whose gravity is only 1.2 percent of Earth's.

The E ring is losing water at the rate of about a kilogram per second due to chemical reactions with sunlight and collisions between particles. Enceladus appears to be pumping out more than enough water to keep the ring supplied, indefinitely. One of Saturn's many mysteries has been solved.

Even more exciting, though, are the implications for astrobiology. That's because the water pools that feed the gey-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sers probably lie only a few dozen meters below the surface. "That's really close," Porco says.

"Once you have liquid water, you have the potential for living organisms," she adds. "That's why this has been so exciting. On this cold little moon we have an environment that is potentially suitable for living organisms."

In fact, Porco says, all of the building blocks of life seem to be present. Not only is there liquid water and heat, but signs of organic chemicals potentially useful to life have been seen in the vicinity of the tiger stripes. And that makes Enceladus the most likely place in the solar system to have life—not something anyone would ever have predicted.

Iapetus: A Two-Faced Walnut

If there were a prize for Saturn-system mysteries, Iapetus would be the odds-on favorite. An ice/rock worldlet about 1,470 kilometers in diameter,[6] it has long been known to be weird, with one side ten times brighter than the other. Close views show that the dark material appears to lie atop the light material, as though sprinkled there from somewhere. But what it is and how it got there remain a mystery.[7]

But that's not Iapetus's greatest mystery. Not only is that worldlet divided east/west into light and dark hemispheres: it's also divided north and south by a vast seam, like nothing else in the Solar System.

When I was a child, my family owned "Toas-Tite" irons: clamshell-shaped pieces of cast iron mounted on long handles, used to make hot sandwiches. You put the sandwich inside, sealed it shut (crimping off the corners of the bread in the process) and heated it in a campfire to produce a remarkably tasty treat. The resulting sandwiches looked like a pair of mini-Frisbees cemented together, with a rim around the edge, where two halves of the clamshell met.

Iapetus looks a bit the same, but rounder.

Most folks think it looks like a walnut. What makes it unique is that it has a ridge, 10-20 kilometers high and at least as many wide, running nearly halfway around its equator. And like so many planetary features, the closer you get to it, the more complex it looks. Iapetus's equatorial ridge turns out to have multiple crests—in places, as many as three—running in parallel, with deep valleys between.

At the December 2005 meeting of the American Geophysical Union, W. Ip of Taiwan's National Central University argued that the ridge is the result of a "collapsed" ring, which somehow fell onto the planet's equator. Maybe. The Saturn system is weird enough that it's unwise to discount any semi-feasible theory. But what the structure *looks* like is a pressure ridge. (The multi-ridge structure is particularly common in pressure ridges.)

The leading hypothesis is that it was created by centrifugal forces during a slowdown in the planet's spin, early in its existence. (The fact that the ridge is right on the equator is a red flag, suggesting that whatever created it must have had something to do with the moon's spin.) Once upon a time, the theory goes, Iapetus probably had a fairly average spin. Now it's tide-locked to Saturn, rotating once every 90 days, so it always keeps the same face toward its primary, just like Earth's moon. The idea

[6] Internet searching reveals numerous, slightly differing figures for the diameters of Saturn's moons. This article uses the figures stated at the 2005 GSA meeting, presumably the most current.

[7] Several of Saturn's icy moons appear to have thin coverings of dark material. Is it the same substance on all of them? If so, does it have a common origin? And what kind of process might sprinkle it across several moons? From a science-fictional perspective, the fun answer is "something blew up," but that's wildly speculative.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

is that the forces that slowed it down somehow caused it to squirt up that big ridge.

Unfortunately, nobody's been able to produce a decent mathematical model of how this could happen. It's possible to design models that create ridges, but they require the underlying material to be soft and fluid enough that the ridge should have subsided under its own weight, once the spin had slowed.

Another prospect is that the ridge is a tectonic feature, caused by shrinkage of Iapetus's surface as the planet cooled. This would allow lava to erupt from below, creating a range of massive volcanoes. Alternatively, shifts in plate segments might have caused the northern and southern halves of the planet's crust to press against each other. On Earth, the Himalayas are produced by such a collision, and despite Earth's much higher gravity, they have reached impressive heights.[8]

Cyclops and the Death Star

Sometime early in their histories, two of Saturn's moons really got clobbered. One was Mimas (diameter 398 kilometers), which bears an enormous crater, one-quarter its diameter, that caused it to be dubbed "the Death Star World" because of its remarkable similarity to the spaceship of *Star Wars* fame. As of this writing, not much else about it is known.

The other cyclops world is Tethys, diameter 1,072 kilometers. Its impact crater is called Odysseus and it, too, produces a world that looks like a giant eyeball, staring off into space, although the effect is not as dramatic because Tethys's bigger size produces enough gravity that the planet has slowly "relaxed" back to a more spherical shape, smoothing out the crater's topography.

Big impact craters are spectacular, but planetary scientists are more interested in mountains and valleys because these are indicative of other types of processes at work. Tethys has a fascinating one: a huge valley several kilometers deep and 100 kilometers wide that runs three-quarters of the way around the planet.

The valley has nothing to do with Odysseus. Rather, it appears to be a very old feature: much like the rim that circles Iapetus, but sunken rather than raised. Geologically, it looks like a graben, which is a deep valley created when a chunk of a planet's crust collapses along parallel faults. You can find such features in America's Great Basin and Africa's Rift Valley, where tectonic forces have attempted to rip continents apart. But nothing on Earth comes remotely close to matching the graben on Tethys.

If you're looking for explanations, the simple one is that something caused Tethys's surface to contract and tear apart. But at this point, it's anyone's guess.

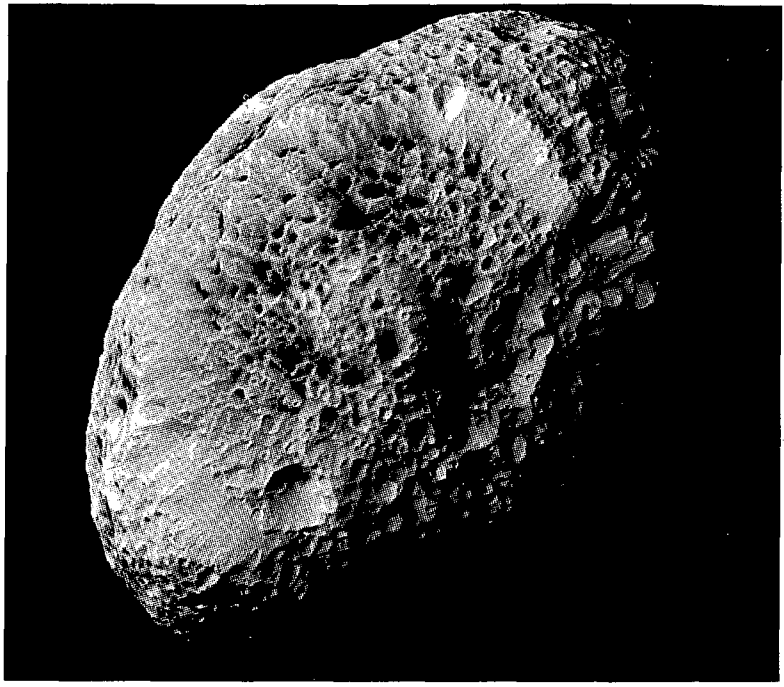
Wispy Dione

As long as we're talking about planet-girdling tectonic features, we should also pay a brief visit to Dione, diameter 1,206 kilometers.

On first glance, it looks like an icy version of Earth's moon. But it isn't uniformly cratered, indicating that portions have been active sometime in the relatively recent past. Its most interesting trait is terrain that looked "wispy" in the Voyager pictures. Higher resolution photos now indicate that these gauzy bands aren't rays from big impact craters or de-

[8] We still need to explain why this feature lies so precisely on the equator. I'm not a geologist, but I've been around enough geologists to be willing to offer my own speculation: perhaps the ridge was created by a two-step process. First, the spin-slowdown created a weakness at the equator. Then subsequent mountain-building tectonics occurred along the same line of weakness. It's probably wrong, but if it does turn out to be right, you read it first, here!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



Hyperion, as viewed by Cassini.
Photo courtesy NASA/JPL-Caltech

posits from geyser-like volcanoes. Rather, they appear to be belts of crevasses or fractures, running long distances across the surface. You can even see bright, clean-looking material spilling down from the tops of these scarps like rocks scaling off earthly cliffs. In places, the wispy terrain's fractures cut across craters, indicating that the planet was tectonically active more recently than those particular craters were formed.[9]

The tectonics of the Saturn system won't be fully understood until we have a theory that explains why you get an enormous ridge on Iapetus, a huge rift valley on Tethys, and "wisps" on Dione.[10]

Floating Rocks

On my bookshelf, I have a potato-sized chunk of a rock called pumice. It has the unique property that if you put it in a bucket of water, it floats.

If you could find a big enough bucket, several of Saturn's smaller moons might do the same. These "under-dense" worlds have densities as low as half a gram per cubic centimeter, which is half the density of liquid water, still a lot less

[9] The highest-resolution photos also indicate that in places there is a finer fabric of smaller fractures angling across the big ones. The small ones appear to have come first, indicating that Dione has gone through at least two phases of tectonic activity.

[10] A moon we haven't discussed is Rhea, diameter 1,500 kilometers. As of this writing, Cassini has yet to make a close visit to it, but from a distance, it shows no sign of major tectonic features. If that proves to be the case on closer inspection, then in its case, it will be the *absence* of such features that will have to be explained.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

dense than ice.[11]

What a setting these worlds would make for an adventure story! Their low densities indicate that they must have the consistency of Swiss cheese. It's possible, of course, that the bubbles simply come from a frothy rock, like pumice. But they could also be caves. And if they're big enough, they might make great hideouts for bandits or serve as ready-made prospecting tunnels running deep into the subsurface. Only small moons can have these features because larger ones would crush them beneath the weight of the overlying rock and ice. But explorers would need to be careful because even in microgravity, having an entire world collapse onto you would be a bad thing!

The best studied of the under-dense worlds is Hyperion, diameter 282 kilometers. It's also one of the strangest objects in the entire Saturn system.

Hyperion made headlines when Cassini made a flyby . . . and released photos of an object whose surface looks like a honeycomb, or perhaps a big chunk of coral.

Within weeks, scientists were tentatively suggesting that these bizarre features might be suncups.

Suncups can be found on earthly snowfields, where they are the result of uneven solar heating. The process typically starts when a dark, sun-warmed rock begins melting into the snow. As a depression forms, it acts as a reflecting oven, capturing more and more sunlight and melting ever deeper. By late summer, suncups can be hip deep on the upper slopes of mountains such as Washington's High Cascades. Hikers hate them.

Close views of Hyperion show that its surface is highly cratered, with the crater walls including outcrops that spill dark talus onto the light-colored material of the crater floor. The hypothesis is that the dark material heats the underlying ice, gradually converting a small crater into an enormous suncup, many kilometers deep and wide.

For this process to work at this scale, you need two things: an ice that vaporizes at the right temperatures, and a small moon. If the moon is too large, you wouldn't get the deep, honeycomb-shaped craters because gravity would cause it to relax into a more spherical shape.

Titan: Cryovolcanic Badlands

As the largest moon in the Solar System, and the only Saturnian satellite with a dense atmosphere, Titan will always be an object of special interest. Partly that's because of its atmosphere, which blocks visibility like a bad day in Los Angeles: not being able to see what's down there makes it all the more intriguing. But it's also because Titan is big: 5,150 kilometers in diameter—slightly bigger than Mercury. It was discovered in 1655 by Dutch astronomer Christiaan Huygens, and is big enough to be a planet in its own right.

Titan is also interesting because of the methane in its atmosphere. Chemically, it shouldn't be there because, in Titan's upper atmosphere, ultraviolet light from the Sun should long ago have destroyed it. The fact that there is methane means it's being replenished from somewhere, probably via cryovolcanism, about which we'll say more in a moment.

The methane is also interesting because, at Titan temperatures, it pays a role similar to water in the Earth's atmosphere: forming clouds (which can be seen on Cassini flybys) and precipitating as rain or snow. Methane rain and melting methane snow should scour the landscape like flowing water, before evaporating back into the atmosphere.

But the ultimate fate of the methane is even more interesting. As it is destroyed

[11] You can calculate a planet's density by knowing its volume (easily measurable) and its mass (determined by how its gravity affects other objects, such as your spaceship).

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

by ultraviolet light, it should form reactive organic species that recombine into more complex hydrocarbons like ethane and propane. These would fall with the methane rains, but unlike methane, they wouldn't re-evaporate. Rather, they should collect in lakes or seas, at a rate of about four inches every million years. Over the life of the Solar System, enough ethane and propane should have rained out of Titan's atmosphere to create at least one large ocean.

Looking at Titan in cloud-penetrating infrared, we see light areas and dark areas. For some time, the leading theory (and everyone's hope) was that the dark areas were hydrocarbon seas, while the bright ones were continents made of water ice or something similar.[12]

Unfortunately, it's not that simple.

Part of the Cassini mission is to map as much of Titan as possible from space, with a total of 45 flybys scheduled by mid-2008. These mapping missions use two basic instruments: radar, and infrared cameras that use wavelengths that provide at least semi-transparent "windows" through Titan's haze.

One of the mappers' goals is to look for impact craters. But by October 2005, they had found only two, says Elizabeth Turtle, a planetary scientist at the University of Arizona.

"We expected many more," adds Rosaly Lopes, a volcanologist with NASA's Jet Propulsion Laboratory in Pasadena, "especially compared to the other satellites of Saturn, where craters are plentiful."

The paucity of craters means that Titan's surface (or at least the portion surveyed so far) is geologically young—constantly being weathered away by wind and rain. The emerging picture, Lopes says, is of a surprisingly young, "incredibly dynamic" landscape, constantly being altered by wind, rain, and volcanic activity. There may also be earthquakes. The imaging team has found long lines that look like scarps or rift valleys, presumably created by motions in the planet's crust similar to those that occur along California's San Andreas Fault.

One of the most exciting early discoveries was a suspiciously lake-shaped feature near the South Pole, about the size of Lake Ontario. "Its perimeter is intriguingly reminiscent of the shorelines on Earth," says Turtle, "smoothed by erosion and deposition."

More evidence that it might be a lake comes from the fact that it lies in Titan's cloudiest region, where methane rainstorms might be particularly common. But it could also be a dry lakebed, where liquid once stood but is now long gone. The acid test would be to catch the glint of reflected light from its surface, but so far that's not been seen.

Infrared observations can only determine the shapes of features. It's hard to determine their topography because even in the infrared "windows," looking at Titan is like looking at an earthly landscape under the flat light of a very hazy day, with no shadows to define the local relief.

Radar mapping does better. It confirms much of what the infrared images appear to show: that the dark areas are smooth lowlands, while the bright ones are uplands. One particularly interesting find is something that looks a lot like a coastline, with a bay surrounded by uplands. Other features include river channels that appear to spill outwash onto the plains, much like earthly river deltas.

Then on late July radar-mapping flyby, the Cassini team struck gold, finding a region with dozens of large, dark patches that looked like lakes. Lots and lots of lakes, up to 70 kilometers in diameter. The discovery made Titan the only body in the Solar System other than Earth appearing to have bodies of liquid at its surface.

Some were fed by river-like channels from the surrounding highlands. But

[12] 1/29/07

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

others showed had no such inlets. This probably means that they're fed by methane aquifers—"methanofers" is the term used by Ellen Stofan, lead author of a study announcing the find in the January 4, 2007 issue of *Nature*—not far below the surface.

"Just like on Earth, if you dig deep enough, the depression fills up," says Stofan, who shares her time between Proxemy Research, in Virginia, and University College of London, England. "There's a subsurface methane table."

Other researchers have generated weather models showing how methane "moisture" could evaporate from the lakes to fuel rainstorms, ranging from gentle drizzles to mammoth, gully-washing thunderstorms.

Cat Scratches

The radar images also revealed vast expanses of thin, parallel striations, up to 100 miles long. "We called them cat scratches because they look like what cats do to furniture," Lopes says.

Initially, the cat scratches puzzled the imaging team. Then someone realized that parts of Earth look very similar from space. There is still some debate, but the leading theory is that Titan has extensive dune fields like those in parts of the Arabian Peninsula. Though, of course, on Titan, the "sand" is probably comprised of ice crystals.

The imaging team has also found one large volcano and other possible lava flows. These are important because, if wind and rain are constantly eroding the highlands, something must be creating new material to be eroded. Otherwise, the entire planet would be flat.

The volcano, named Ganesa Macula for the Hindu god of good fortune, takes a shape called a "pancake dome." That makes it similar to features on Venus, produced by the oozing of high-viscosity lava with low gas content. But unlike earthly or Venusian volcanoes, Ganesa Macula would erupt "cryolava," comprised of a gelatinous ammonia-water mix which, at 175°K (-140°F), is "hot" only by Titan's frigid norms. Despite the low gas content, these lavas could release enough methane to the atmosphere to replenish that which is destroyed by sunlight.

But we didn't merely study Titan from space. We also landed on it.

The Cassini mission carried a second probe, called Huygens, which detached from the main one on Christmas Day, 2004, and parachuted to the surface on January 14, 2005.

The landing didn't get as much news coverage as it deserved, because the day after the two probes separated, Indonesia was hit by the largest earthquake the world had seen in four decades, and most people's attention was directed toward the ensuing tragedy. But Huygens quietly did its job, and the results are now trickling into the scientific journals.

With an atmosphere four times as thick as the Earth's, Titan is a dream-world for exploring by parachute—especially because, unlike the Solar System's other hard-surfaced, dense-air planet (Venus), its atmosphere is cool, free of corrosive chemicals, and basically friendly to electronics. "The atmosphere that makes it so hard to see makes it one of the easiest planets to land on by parachute," says Laurence Soderblom, an astrogeologist with the U.S. Geological Survey in Flagstaff, Arizona.

It took the probe two-and-a-half hours to descend, after which it survived on the surface for at least an hour. It may have survived longer, but at that point, Cassini passed below the horizon and telemetry was cut off.

The probe had a battery of cameras that rotated as it fell, permitting them to scan in all directions. As the probe drifted on the wind, the cameras could look at the same terrain from different angles, allowing the pictures to be built into three-dimensional images via a technique similar to that used for converting aerial photos of the Earth into contour

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

maps.

As of late 2005, only two sets of these images had been produced, each covering upland areas of about 1 kilometer by 3 kilometers. One reveals a region of multiply-branched drainages, like the headwaters of earthly creeks in well-watered regions. The other shows a region where the drainages are stubbier and less intricately branched, as is common in spring-fed canyonlands. In both cases, the surrounding land is steep, rugged, and complex, with slopes of up to 30 degrees—the type of thing future astronauts would find difficult to walk across, and another great setting for a science-fictional story of high-stakes hide-and-seek. The steep terrain also means that when the methane rains fall, they create flash floods with enough power to carve deep valleys, despite a surface gravity that is only 13.9 percent of Earth's.

"Even though the bedrock is water ice and the rain is methane," Turtle says, "it could be a very earthlike place."

To the joy of the research team, the probe came down in one of the dark plains, not far from a major "shoreline" boundary with the adjacent highland.

The goal had been to hit one of the dark areas, in the hope it might be a lake or ocean, but it was pure luck to come down so close to a boundary.

When the probe touched down, Soderblom says, "We didn't know whether it would go sploosh, splat, or tinkle. Instead, it went thud, hitting moist sand, somewhat like crème brûlée." High levels of methane in the atmosphere indicated that liquid methane was nearby, but apparently it was underground, not in a pool on the surface. Perhaps some of the hoped-for ethane is in the same place.

The landing site was close enough to one of the river deltas that it's covered in rounded "rocks" of ice, carried by floods running out of the nearby highlands. These rocks range from about one to six inches in diameter. This means that by the time they reached the landing site, the floods had slowed enough to leave bigger rocks behind, but were moving fast enough to scour smaller ones away: exactly what geologists see with earthly flash floods.

"The most striking finding," says Soderblom, "is that a place I expected to be alien and un-earthlike turned out to resemble a modern textbook in geomorphology."

From a science-fictional perspective the Cassini/Huygens mission also teaches a broader lesson.

For years, science fiction writers have viewed gas giants as uninteresting places. Perhaps they are. But their moons: that's a different story. Gas giants, it would seem, have collected some of the most interesting real estate in our own solar system, and there's no reason to believe they wouldn't do so elsewhere, as well.

Based on the Cassini mission, if I were an interstellar explorer looking to find strange new worlds, I wouldn't waste time with the scattered rocks of the inner system: I'd head straight for the nearest gas giant and start exploring its satellites. ■

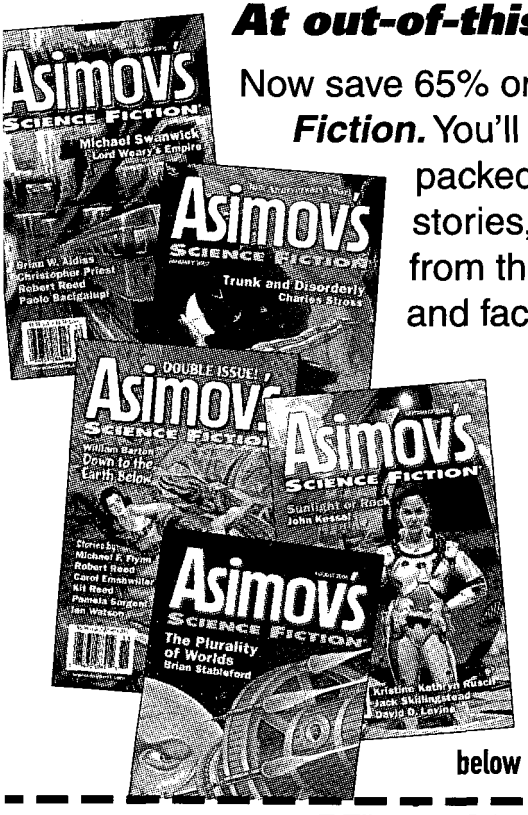
MOVING?

Please send both your old and new address (and include both zip codes) to our subscription department.
Write to us at: *Analog Science Fiction*, Dept. NS, 6 Prowitt St., Norwalk, CT 06855-1220. Or on our website: **www.analogsf.com**

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The SCIENCE FICTION You Love

At out-of-this-world Savings!



Now save 65% on ***Asimov's Science Fiction.*** You'll get 5 back issues packed with novellas, short stories, and guest editorials from the best science fiction and fact writers of today.

To order, just fill out the coupon below and mail with your payment today.

DELL MAGAZINES
Suite SM-100, 6 Prowitt Street, Norwalk, CT 06855-1220

☑ **YES!** Please send me my **Asimov's Science Fiction Value Pack.** I get 4 back issues for just $6.95 plus $2 shipping and handling ($8.95 per pack, U.S. funds). My payment of $_____ is enclosed. (IAPK05)

Name: _____
(Please print)

Address: _____

City: _____

State: _____ **ZIP:** _____

Please make checks payable to Dell Magazines Direct. Allow 8 weeks for delivery. Magazines are back issues shipped together in one package. To keep prices low we cannot make custom orders. Add $4 additional shipping and handling for delivery outside the U.S.A.
Offer expires 6/30/08.

17C-NN5VL1

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Father Hagerman's Dog

Scott William Carter

People adopt new technologies at their own rates and in their own ways. . . .

Rounding a bend on the gravel road, the low sun momentarily blinding him, Marty finally came to the white picket fence that was the edge of Father Hagerman's farm. Everybody called it a farm even though it was only a few acres, because that's what Father Hagerman wanted it called, and nobody in their right mind contradicted Father Hagerman.

Marty's collar was damp with perspiration. The dashboard fan blasted a steady stream of warm air. Turning onto the dirt drive, he saw a white cottage nestled among a grove of birch trees. A dozen chickens pecked at the ground next to a large, fenced-in garden full of corn, cabbage, and other vegetables. He remembered picking pumpkins there every October with his mother, back when they lived down the road.

He killed the engine. The Gonzo curled in the passenger seat—nobody would be able to tell it apart from a golden retriever at a glance—opened its eyes and perked up its ears. Marty checked his appearance in the mirror, straightening his tie and brushing his unruly black hair out of his eyes. He frowned, thinking about the con artist who got him into this mess. *The Gonzos sell themselves! You'll not only make enough money for college, you'll be able to buy a house!* What a bunch of garbage. After a month of trying, he was just hoping to break even on his investment.

He got out of the van, smiling his salesman's smile, and looked up as the screen door banged open.

His smile faded when he saw that Father Hagerman was dressed in nothing but white jockey undershorts.

The old man, over six feet tall and as thin and tan as a copper wire, held his hand over his eyes to block the sun. Then he threw his arms wide.

"Marty!"

He bounded down the wooden steps. Mortified, Marty used the van door as a shield, thrusting out his hand in the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

hopes that no other physical contact would be required.

Hagerman pumped Marty's hand furiously, his thick glasses glinting in the sunlight. "Marty, my boy," he said.

"Hello, Father," Marty said.

Even though Hagerman had been kicked out of the seminary for seducing nuns some fifty years back, he still insisted on being called Father. He was bald on top, but the hair on his chest was thick and white. When Hagerman opened his mouth, Marty saw that most of his teeth had been capped with gold. The last Marty had heard, Father Hagerman was worth over ten million dollars, all of it inherited from his parents' oil drilling days. His chief occupation the last fifty years, other than playing at being a farmer, had been writing angry letters to the local *Two Spoons Gazette*.

Hagerman finally stopped shaking Marty's hand, stepping back and appraising Marty as if he were livestock up for auction. Marty did his best to keep his gaze at eye level.

"I remember you when you was just a pup," Hagerman said, and put his hand out, waist-high. "Got kids yet?"

Marty laughed. "No, sir. I'm only twenty-one. Still in college."

"Well, *sheeoot*," Hagerman said, which was something Marty remembering him saying often. "That don't stop most kids these days. How about this weather? Too damn hot for clothes, I'll tell you that. What brings you here?"

Marty was trying to decide the best way to answer that question when a mangy gray mutt, as fat as Hagerman was thin, pushed open the screen door and slumped onto the porch. The animal's mixture was impossible to guess. It looked out at Marty with glassy eyes, a line of slobber dribbling from its mouth. The mutt's fur was patchy and thin, and one ear was missing.

Marty smiled. If this was his competition, then selling the Gonzo was going to be easy.

"Well, sir," he said, "I've got a little something I'd like to show you."

Hagerman's thin white eyebrows arched. Marty wasn't sure how the old man was going to react when he found out why Marty was there. He remembered the time Hagerman chased off a pair of Mormon missionaries with a shotgun.

"Well, I see you have yourself a dog," Marty said, warming into his sales persona. "Now what I've brought with me—"

"That there is Chib," Hagerman chirped.

"That's an interesting name. What I also think you'll find interesting—"

"Stands for Cold-Hearted Insane Bitch. If you spend five minutes with her, I think you'll agree it's fitting."

Marty lost his train of thought. "Er . . ."

"Hell, you look positively piqued, boy," Hagerman said. "Why don't you come in and have some lemonade? I'll read you some scripture. I'm doing Matthew."

He turned to the house. His bony back was even more tan than the rest of him.

"Sir," Marty said, realizing he was going to have to be more direct, "I've come to see if you might like to buy a Gonzo 450."

The old man had put one foot on the creaking porch. He turned, confusion registering on his face.

Marty cleared his throat. "A Gonzo . . ."

"I heard you. What is it?"

Hagerman's lips were pressed into a thin line. Marty wondered if he was making a mistake. This was, after all, the man who had challenged the local postman to a duel after the postman informed him the price of stamps had gone up three cents.

"Well, sir, it's a dog," Marty said. "Not just any dog, mind you. A special kind of—"

"I got a dog," Hagerman snapped.

"Yes, sir. I see that, sir. But this—"

"So you came all the way here to sell me a dog?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"No, no. I came to see *you*. But this isn't an ordinary—"

"How long has it been since you've been here? Four, five years? And you come trying to sell me a dog. I've always had one dog. I'm always going to have one dog. No need for more."

Frustrated, Marty turned to the still-open van. "Gonzo, come!" he shouted.

The robot leapt out of the car, landing gracefully next to Marty. It wagged its tail but otherwise stood motionless. Chib raised her head for a moment, then slumped back onto the porch.

"Nice retriever," Hagerman said. He squatted next to the robot, scratching it behind the ears. "Obeys well. But I'm still not buying it."

"It does more than obey well," Marty said. "It obeys perfectly."

Hagerman stood. "All dogs crap on the carpet once in a while."

"As I was trying to say, sir, the Gonzo 450 isn't an ordinary dog. It's a robot."

Hagerman laughed. "A robot dog?"

"That's right."

"Kind of like them metallic-looking bag boys at the grocery store?"

"You got it. Only these robots are made to look and act like the real thing, only better."

"Hell, I wouldn't have known unless you said so. I read about these in the paper. How do I know you ain't joshing me?"

Marty looked back at the Gonzo 450. "Roll onto your back, Gonzo," he said. The dog complied, putting all four feet in the air. Marty got down on his knees and popped open the chest compartment, revealing the battery. He pulled out the plug, holding it up so Hagerman could see it.

"You recharge him every night," Marty said. "It's the only way to know he isn't real."

"Looks like a her."

"Oh, well, yeah. They come standard as females, but you can get males, too."

"With little peckers and everything?"

"Um . . . yes, sir. That's right."

Hagerman slapped his knee. "Well, *sheeoot*. What will they think of next? A robot dog with a pecker. I thought I had seen it all. They don't hump other dogs, do they?"

Marty felt a flush spread across his face. "No, sir. No, they don't need to do that."

"Could you program them to do it?"

"Ah . . ."

"Just kidding," Hagerman said, punching Marty so hard in the arm that Marty stumbled back against the van. "So you drove all the way up here to sell me a robot dog? They out of robot vacuum cleaners or something? Look, son, you know I'm not going to buy one, so I'm sorry to waste your time. You say hello to your mom and dad for me."

He turned to go. Marty knew he needed to go for broke.

"Okay, sir," he said. "Sorry to bother you and all. I'm just trying to earn some money for college."

The old man turned and looked at him, his expression softening. Marty hated using the sympathy angle, but the truth was, he needed any help he could get. If he didn't sell at least one of the Gonzos, he wouldn't be going to school that September at all. He climbed into the van as if he was going to leave.

"Isn't your daddy helping you?" Hagerman asked.

"Come, Gonzo," Marty said. The dog leaped onto his lap and stepped across him into the passenger seat. Marty looked up at Hagerman. "He's trying. His company almost went under and he's digging out from under a lot of loans."

"So you thought you'd sell robot dogs to pay your way through college?"

"Among other things," Marty said. "I work during the school year, too. But because my father's income was good until lately, it's almost impossible for me to get financial aid."

Marty started the car. The electric engine buzzed, then settled into a quiet purr.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Well, I better be going," Marty said. "I'll use the daylight while I have it."

Hagerman sighed. "Hold on, now."

"Sir?"

"Come on and give me your sales pitch. I'll listen." He leveled a bony finger at Marty. "But no promises, you hear?"

Marty smiled. "Sure, but I tell you, the Gonzo sells itself."

Hagerman grunted. Marty killed the engine and climbed out of the car, then called for the Gonzo to follow. In the fading light, the color of the pine trees was deepening from green to black. Yet there was still enough light that Marty spotted a stick on the ground by the porch. He picked it up, tossing it as far he could down the drive. Chib raised her head but didn't move. Neither did the Gonzo, but Marty knew that was because of the programming.

"Fetch, Gonzo," he said.

The robot burst into a run, kicking up gravel in its wake. Its graceful stride was a beautiful thing to watch.

"Fast," Hagerman marveled.

"You got that right," Marty said. "All the models can run about three times faster than their biological counterparts. Not only that, but imagine having a dog that doesn't need to eat, sleep, or produce waste. You plug it in nightly as a rule, but it's got a two-week charge. You want to pull an all-nighter, your Gonzo is right there with you."

The Gonzo returned, placing the stick at Marty's feet. He picked it up and tossed it again. The robot took off after it. Chib got up and sauntered down the porch, settling in the tall grass at the edge of the gravel. She never once glanced at the stick.

"Notice how I didn't have to issue the command again," Marty said. "The robots have an intuitive understanding of what is expected of them. But only the good things. This dog won't bite children or tear up your drapes. It won't run in front of a car chasing a squirrel. Plus they adapt easily. You want it to pick up your newspaper, you only need to show it once."

The robot came back, depositing the stick. This time Marty ignored it.

"Sleep, Gonzo," Marty said.

The dog sank to its belly and closed its eyes.

"It'll stay like that all day if I let it," Marty said.

"Heck," Hagerman said, "Chib will do that right now."

Marty ignored the comment. "They're programmed initially with over two hundred tricks. Most of these commands are intuitive—sit, roll over, shake—but there's a guidebook included, too. Here's the kicker. With the 450, the programmers have made a breakthrough. The robots are now able to adapt to your needs in ways they never could before. In time, this dog will fit you just as well as your . . . er, personality." He was going to say clothes, then realized how stupid that would sound since Hagerman wasn't wearing any.

The old man scratched the hair on his chest. The sky above the trees was going purple.

"They like being petted and all that?" Hagerman asked.

"Sure," Marty said. "They respond to affection."

"Respond . . . But do they like it?"

"I'm not sure I see the difference."

Hagerman shrugged. "How much they cost?"

Marty told him. Hagerman whistled.

"I know it seems like a lot," Marty said, "but it's really about the cost of a two-week vacation. Plus Gonzo Incorporated backs every product with a hundred percent guarantee. If you don't find this to be the most perfect dog you've ever had, just send him in within ninety days, and they'll give you your money back."

Hagerman made a noncommittal sound. He looked at Marty a moment, then gazed at his vegetable garden.

"Maybe you'd like to come up and get a pumpkin this year," Hagerman said.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Marty tried to keep the impatience out of his voice. "That might be nice," he said.

"No charge, of course."

"That's very generous."

Hagerman looked down at the Gonzo. "Well, I guess you convinced me. I'll be right back."

Hagerman headed into the house. His feet left footprints in the dust on the porch. Chib yawned but didn't get up.

Marty felt like crying out with joy. It was true that Father Hagerman was probably doing it out of pity, but Marty didn't care.

"You won't regret it at all," he called after him.

The old man returned a few seconds later. Marty's smile vanished. Hagerman was carrying a black, double-barreled shotgun.

The old man stopped on the porch, the gun held loosely at his side. It was a rusted-out thing, something that must have been passed down to Hagerman through the generations.

"Sir . . ." Marty said, his voice cracking. He couldn't get himself to say anything else. His lungs refused to take in air.

When Hagerman came down the steps, Marty realized that he had underestimated the insanity of the old man. If only the Gonzo's self-defense protocols weren't turned off until a sale was made . . .

Just when Marty was about to run, Hagerman suddenly swung toward his scrawny dog lying in the grass. He pointed the shotgun at the dog's head, the fading sunlight glinting off the black metal.

"Got to be done," he said, cocking the hammer.

"Sir!" Marty cried.

Raising an eyebrow, Hagerman looked at him. "I told you I only need one dog," he said.

Marty swallowed. The lump in his throat felt as big as one of Hagerman's pumpkins. The mouth of the barrel was only inches from Chib's head.

"But sir," he said, realizing he had to tread lightly here, "you can't just . . . kill her."

"Why not? Your dog is better in every single way."

He pressed the gun down on Chib's head, flattening the coarse fur. One of Chib's eyelids opened a crack, then shut.

"Please," Marty said. "You can't do this . . . I mean, don't you care about her?"

Hagerman turned to Marty, and for the first time, Marty realized it was all an act. There was a gleam of amusement in Hagerman's eyes. He lowered the rifle.

"So there's another reason to have a dog then?" he said, cracking a gold-toothed smile.

It was a strange mix of emotions that Marty felt—relief that there would be no gunshot, and disappointment that he was not going to make a sale.

"You see, son," Hagerman said, "it's hard to love a dog unless there's a chance it don't love you back." He opened up the barrel and turned it to face Marty. "Empty. Just in case you were wondering."

Marty nodded. His heart was still racing, but he attempted a smile. "I appreciate your letting me talk to you," he said, and turned back to the van. The drive home suddenly seemed much longer. It would be all right, he told himself. He would just have to work two jobs all year.

"Where you going, son?" Hagerman asked.

"Home," Marty sighed, opening the door. He was about to call the Gonzo, which was still sitting quietly.

"Well, aren't you going to sell me the dog first?"

Marty looked at Hagerman. The old man didn't appear to be joking.

"Sir?"

"You heard me."

"But . . . what about . . . I thought you only needed one?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Hagerman nodded. "That's right. I've got Chib. But I still need someone to watch my garden."

There was no doubt in Marty's mind that Father Hagerman was insane. It didn't matter. He wasn't going to argue.

Hagerman went into the house to get his money, returning with a wad of cash. Hardly anyone used real money these days, but it didn't surprise Marty that Hagerman did. The old man filled out the necessary paperwork. Then, after issuing the proper voice commands to program the dog to respond to Hagerman, the transaction was done.

"I'm really grateful," Marty said.

"Don't thank me," Hagerman said. "You just get on back here in October and get yourself a pumpkin, all right?"

They shook hands. Hagerman turned to the house, the Gonzo following on his heels. Marty climbed into his van. He realized he had forgotten to give Hagerman his user manual.

He rolled down the window. "Oh, Father!" he called, holding up the manual with the other hand. "This is yours."

"Keep it," Hagerman said.

It wasn't until Marty returned on a cool Saturday in October that he realized what Father Hagerman meant. Coming up the drive, he saw that nestled among the tall cornstalks and the plump, shiny pumpkins was the Gonzo. Marty almost didn't recognize it. It was standing on its hind legs, braced against a wooden post. It was dressed in a red plaid shirt, rolled up blue overalls, and a straw hat. Marty knew, from how still it was, that the battery had long since died.

There wasn't a crow in sight. ■

CUSTOMER SERVICE OR SUBSCRIBER ASSISTANCE

Please direct all changes of address and subscription questions to:

ANALOG SCIENCE FICTION
6 Prowitt Street,
Norwalk, CT 06855

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

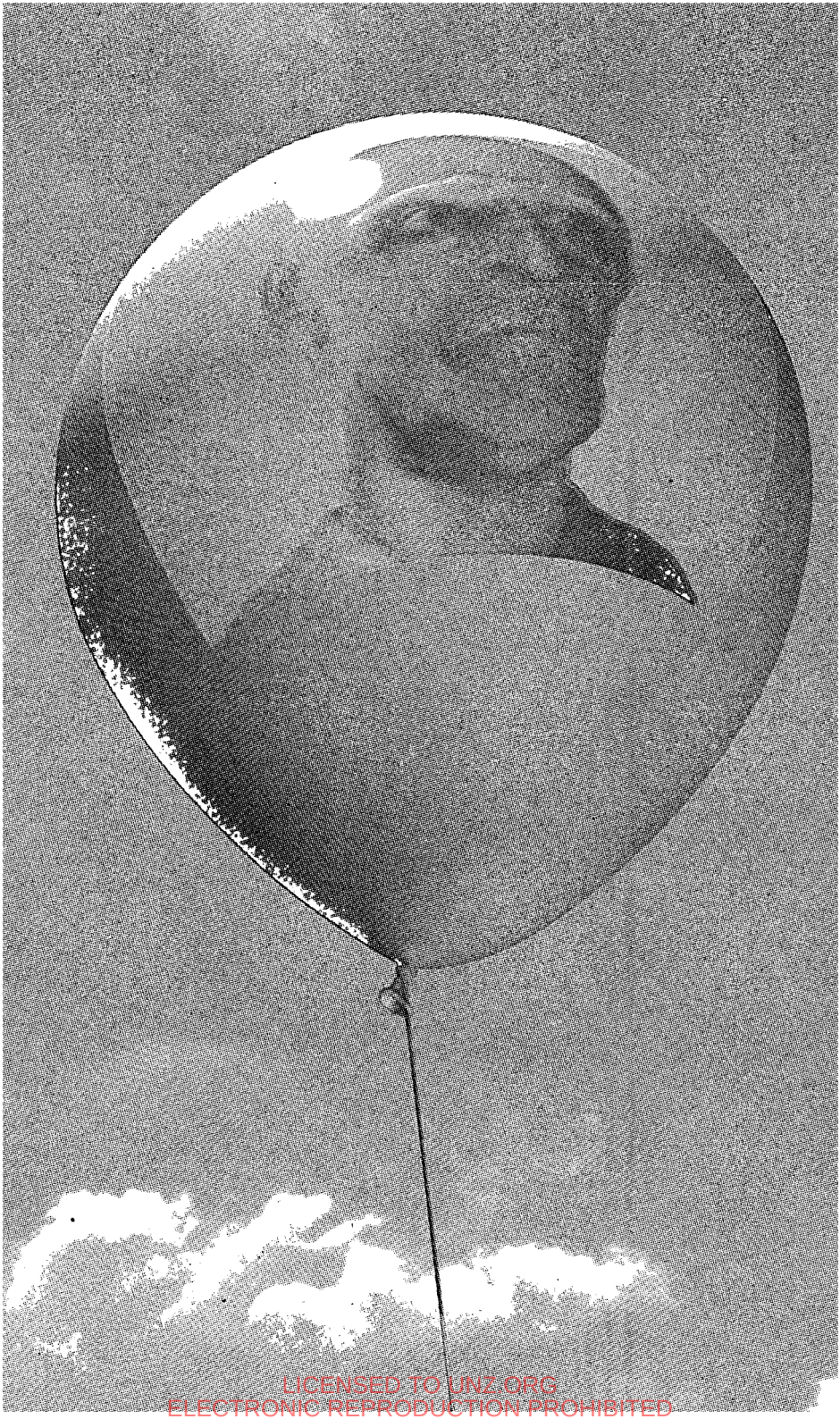
Every mode of communication has its own strengths and weaknesses —and emergency reserves.

On the Bubble

Rajnar Vajra

Illustration by Nicholas Jainschigg

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

August 16, 2028

Eve Horton, my youngest granddaughter, reeled in the string tied to her wrist to pull my face down to her eye level. She peered at me, then held my imaged mouth near her left ear. Evidently, my smile wasn't enough and she wanted to *hear* me claim I was having fun. A helium-filled balloon, even one sprayed with x-change paint, makes a poor loudspeaker, so I gave her the white lie in as much of a bellow as my dying lungs and senile vocal cords could manage. Satisfied, she let me, or rather my point of view, float back up above crowd level.

Despite the clear afternoon sun, lightbulbs were glowing; thousands beaded tightly on high lines connecting each fairground structure to its neighbors. To most people in the cotton-candy sticky, Tilt-a-Whirl dizzy horde, this might've seemed wasteful—assuming they noticed. And cared. But my engineer's eye was still sharp enough to spot omni-voltaic foam sheathing rooftops and tents. Ergo, this redundant illumination wouldn't add a penny to anyone's electric bill and probably helped prevent overcharging whatever batteries lurked in the park's power shed. Still, according to Horton's Third Law, or maybe the Fourth, since I've never finalized my list, every thrifty act has some hidden cost. In this case, checking bulbs and replacing dead ones couldn't come cheap. And unlike me, not one of the countless lights was burned out.

A boy, not yet a teenager but surely a good five years older than my Evie, passed us towing a balloon displaying a fellow sufferer's face: grandmotherly, age spotted, and friendly. Her eyes were as pain lined as mine, but she winked at me just before two bulky men with "Manny's Maintenance" emblems on their gray coveralls stepped between us. I *think* she winked; could've been a transmission glitch. With so many people around, some other x-change tourist might be operating on a microwave frequency close enough to cause interference. . . .

I shifted attention to the translucent clock in my peripheral display. Twenty miles from the fairground, in the hospice wing of Saint Teresa Hospital, in the room I shared with the always astonishing Juan Diego Lopez, I pressed the "attention" button on my x-change remote to make the balloon flash rainbow colors. Eve was too busy tugging both me and her mom toward a food stand emblazoned with those appetizing words "Fried Dough" to look up, but her mother, my daughter-in-law Amanda, was more alert.

"What is it, Fred?" she asked before remembering she wouldn't be able to hear the answer. "Wait a second, sweetheart," she told Eve, "Grandpa's trying to tell us something."

Frowning, Evie pulled me down again and turned the balloon so both of them could admire my wrinkles.

"Kids," I shouted, triggering a juicy cough. I gulped some water and continued. "Those custodians who passed a moment ago reminded me. Got an appointment coming up with a technician here at the hospice. Be offline for maybe twenty minutes." Cough, sip. "I'll flash hello when I return."

Evie's frown deepened. "But Grandpa! You promised!"

"I couldn't promise to be with you every single second today, honey. Honest, I'll be back before you know it."

"Well, I suppose."

"Listen to your mother, okay? And Amanda, *please* be careful."

"You know I will, Fred." Poorly disguised annoyance edged her voice. "Besides, my job here today isn't to catch 'em, just spot 'em."

"Right. Sorry." I turned off the feed, pushed the featherweight x-change "glasses" onto my forehead, and shoved the video lens staring at me to one side. I kept my expression neutral, but with Lopez nearby I might as well have been wearing a placard.

"You are troubled, *amigo?*" My roommate was standing, practicing one of his Qigong exercises. Perhaps calming him-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

self before his scheduled afternoon surgery, although he never seemed concerned about being sliced open.

"Troubled, yeah. Silly of me, I'm sure. It's just that Amanda's using my granddaughter again as—as what we used to call a 'beard' back in the day." Come to think of it, "back in the day" had long since gone belly-up.

Lopez smiled, spiraling one hand above his head, palm upward, while the other twirled at his waist. I'd never met anyone before who'd converse while doing Tai Chi, Qigong, Yoga, or the like, but Lopez was one of a kind. Still, he didn't respond until completing a slow inhalation. "I understand you. But you've told to me Amanda is on duty most weekends, so how else could she enjoy these hours with her daughter?"

"I know, I know. Just can't abide the idea of mixing police work with daycare. Not with *my* granddaughter." County ordinances require an official police presence wherever enough people are gathered, but Amanda's team was mainly on the prowl for drug trafficking. The park's hired security guards could handle most pickpockets, flashers, molesters, and idiots with overly short fuses.

"Honestly, Juan, I've never been quite sure about Amanda. Don't say it! Knowing you, you're probably about to tell me I should be grateful for the chance to get to know her better. Oh hell, I am grateful. And I'm for sure grateful to be with Evie."

"This is good. Gratitude is my favorite of emotions."

"Really?" He was trying to distract me and I appreciated it. "Would've thought you'd favor . . . love or compassion considering the way you go on about those two."

He began the leisurely arm swings of the form he called "Dragón de la Natación." "Love and compassion, Fred, are wonderful and holy feelings, but may not of themselves drive *el cachorro de león* from his castle."

"The lion cub?" Before rooming with Lopez, my Spanish had nearly rusted away.

His smile widened. "My affectionate way of saying 'ego.' What emotion other than gratitude makes the heart glow, yet pushes the self aside without pain?"

Smoothly, as if he'd completed his long Swimming Dragon routine rather than just begun it, he slipped into his bed and pulled the thin covers up.

"What's wrong?" I asked, surprised.

"I did not believe she was due for some time." He chuckled. "My hope was to be in surgery by then."

"Jesus!" I muttered, turning to stare into my bedside water glass, half expecting the surface to display *Jurassic Park*-style compression ripples. But Mary Reed, our thrice-a-week in-room physical therapist only had the personality of a T-Rex, not quite the mass. Still, her tread was heavy enough to feel through my mattress now that Lopez had alerted me. A moment later, the woman herself opened the door and tromped in, three hours ahead of schedule.

"Afternoon, boys! Bill Meyer over at Cedars, bless his sweet soul, passed away last night so's I'm free this morning and I thought we'd get to you boys, hey, *temprano*. That means 'early.' Don't it, Juan?"

"Most certainly," Lopez said in his smoothest caramel voice.

Mary wasn't one ounce overweight, but was a neutron star of a woman: small and improbably dense with linebacker muscles compressed onto a five-foot-five frame. Her race was anyone's guess; her mop of hair was dyed white-blond with a scarlet streak in front; her hands were short but thick as mittens. She clearly viewed me as a particularly willful toddler but Lopez as a saint on his deathbed. In fact, cancer notwithstanding, he only acted infirm when she was around, his graceful way of avoiding certain exercises he considered "bad for the chi." Considering he'd already lived three years past his doctors' most optimistic prognoses, he seemed to be on to something.

"Everyone ready?" Mary asked rhetorically.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Perhaps some other time," I offered. Given a shred of hope she'd go easy on me, I would've confessed how far I'd cut down on my pain meds this morning to keep a clear head for my granddaughter's sake. But I knew Mary better than that.

Ignoring my comment, she deposited her case of torture implements on my mattress and threw it open with her usual violence. "You been out of that bed at *all* today, Freddy Horton?"

"Sure." Twice, and only because I can't bear to use a bedpan, and each twenty-yard trip to the john took fifteen minutes. Each way. When I'm low on meds, it hurts just to stand.

She eyed me dubiously. "Let's change up the order today. After our warm-ups, hey, we'll move on to stretching, then the ankle weights, wrist weights, and you better believe we'll end with more stretches. Okay?" She plucked the x-change glasses off my head, tossing them onto my bedside table, snatched my blankets away, and ordered me to start wiggling limbs. Of course, she respectfully asked Lopez's permission before removing his covers.

Not being fond of either agony or embarrassment, I didn't enjoy flailing my arms and legs. But it was fun and dignified compared to what was coming up. Mary was a big fan of "resistance stretching," a somewhat counterintuitive technique developed by one Bob Cooley, God knows how many decades ago. The idea was to stretch muscles that were simultaneously contracting and fighting the stretch. The technique supposedly reduced the pain of stretching and reduced the chance of injuries, and I freely admit it didn't hurt nearly as much as the Yoga stretches inflicted on me by my previous therapist. But it was absurdly hard work and uncomfortable even on days I was pumped to the gills with analgesics.

Naturally, Davis Preston, the hospice's handyman, arrived to install the new TV screen while I was performing the most humiliating stretch of the lot: a kind of leg press against a padded board, which Mary pushed toward me with no apparent effort.

"If'n you don't shove harder than that, Freddy Horton, you'll be bound to suffer decalficication." I'm sure she deliberately mispronounced the word, just to add aggravation to insult.

Dave, pretending not to hear my grunts, or see the way my leg trembled, or notice my involuntary bursts of high-decibel flatulence, peeled the old forty-five-inch screen off the wall with a thin-bladed scraper. Flakes of paint behind the screen came off as well, but not enough to create a problematic texture. He measured and taped off the perimeter of a much larger rectangle, gave the area a light sanding, and sprayed on a new screen in several light coats, perfuming the room with the plastic sweetness of some water based solvent—improving the usual reek. He squirted a blobette of gel at one edge, stuck one end of a power cord into it, and the cord's far end into a ceiling socket.

"This baby should be much easier to see, Fred," he said between my latest gasps. "Seventy-five inches! And not only bigger, it's an updated model. Just let it set for a good half hour before you turn it on and everything should be fine. I'll come back to pull off the tape around suppertime. You remember how to do the adjustments? This one'll be way too bright just out of the can."

"I—damn it, Mary, stop that for just one damn moment!—of course I remember. Thanks, Dave."

"No problem."

When and why did people replace "you're welcome" with "no problem"?

"How you doin' with those ankle weights, Juan?" Mary asked, placing the padded board on my upper thighs and gesturing for me to lift my legs.

"They get heavier every week, Maria."

"Well, maybe it's time I get you some lighter ones. Hey, c'mon Freddy, *lift*. You want total decalficication?"

After the blessed moment of Mary's departure, I gave my new and improved TV

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

screen a nice glower before retrieving the x-change specs. So often in our glorious world of competing businesses and mutual lawsuits, everyone wins. Except for the public. The x-change system, once invented, should've put ordinary TV screens on the endangered technologies list. The glasses, streaming visual data directly into human optic nerves, provide better clarity and control than even scientific-grade Light Emitting Plastic because they surpass limitations inherent in even the best human eye. But the entertainment networks were already in bed with TV and microprocessor manufacturers and wouldn't grant X-change Incorporated the relevant licenses. . . .

I propped myself up on my pillows and pulled the video lens and microphone toward my face. "Headed back to the granddaughter, Juan."

From the corner of my eye, I saw him get out of bed and resume his exercises. "Have fun, *amigo.*"

"Thanks."

I winced as the system came online, leaving me floating above and to the right of Eve's head, facing directly into the sun. The automatic filters reacted fast, but left me in a detail-obscuring sepia murk. So I had to override the filters. Eyes tearing, lids at quarter mast, I pressed the attention button and this time not even Amanda noticed. The sun had to be washing out the balloon's flashes. I fumbled around for the camera control and rotated the brightness dial to full.

That did it. Both my loved ones gawked up at me and joined me in squinting.

"Grandpa!" Evie shouted.

Amanda blinked and shook her head. "You might want to turn that down a shade, Fred. You're blazing like an archangel on a mission. You'll scare someone."

I adjusted the setting without bothering to reply; floating as high as I was, she couldn't have heard me over the crowd noise.

"Much better. You missed fried dough and the petting zoo." She grabbed my string and pulled me within easy hailing range. "And some c-u-t-e things somebody said." Amanda glanced at her daughter, who was paying too much attention. "Tell you later." Her words sounded cheerful enough, but I thought her tone was a bit distracted.

"I would've loved to see her at the petting zoo," I yelled. She pulled me even closer. "But it turned out lucky I had that appointment." All that anti-decalficication had left my muscles shaky, but my voice, if nothing else, was stronger. "My PT showed up hours ahead of time. So the good news is that all my afternoon business is out of the way. Where are we going? Out of the sun, I hope?"

"Glassblowing demonstration dead ahead. We're going to watch someone making paperweights or vases, but I've been instructed to ask if a unicorn might be in the offing."

"Oh? Well, speaking as a balloon, let's not get too intimate with any open furnace."

"Don't worry, we won't let you pop, Pop. But if you do, I brought along whatever's left in the can. We can always buy a new balloon."

I shook my head. "It's not that easy, Amanda, with us this far away. The system has to set up phase-lock-loops that—Amanda, are you listening?"

"Sure, Fred. Phase-lock-loops. You're forgetting something. The equipment you've got at Saint Teresa's and the paint I'm carrying aren't the kind you can buy at Sears. This is police issue, military-grade equipment, with all sorts of bells and whistles. Believe me, if we have to spray some more on, it'll hook up just fine."

She hadn't fooled me; I could tell her attention was elsewhere. I was accustomed to her eyes constantly roaming while she was on duty, and they were roaming now, but kept returning to a spot somewhere behind me. Since she'd only sprayed one side of the balloon with the paint, I couldn't dial around to see what she kept peering at. Then a lucky gust of wind turned

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

me just far enough. And I still couldn't pick out anything unusual. . . .

"Something wrong?" I asked.

"No. I don't think so."

"Talk to me, Amanda."

"Really, it's nothing." She turned me around to face her. "I just keep noticing the fairground crew."

"Manny's Maintenance? What about them?"

She shrugged. "Never seen so many around. And I don't recognize most of them. But they have to be legit, because the ones I do recognize have no problems with the others."

"I suppose. Still . . . they don't work directly for the city, do they, but for a private company. Whichever put in the low bid. Just like the security guards."

"C'mon, Fred! You're not suggesting the entire company could be up to something shady? Feeling a bit paranoid, are we? That's an occupational hazard of *mine,* and I try to keep it under control. Anyway, right from here you can see a reason why there might be some extra maintenance personnel around. Let me turn you again. See all that activity near the power shed? They're probably fixing or upgrading something."

"Amanda, I think you and Evie should go home. Now."

She frowned and glanced down at her daughter who seemed to be ignoring the adult conversation. "Why?"

"Those men leaving the shed aren't carrying any tools."

"So? They probably left them inside and plan to come back and finish whatever job they're doing. You're overreacting. I'm sorry I brought up the whole thing."

I tried to keep my voice calm and my expletives deleted. "You're a good cop, Amanda, and I'll bet you've grown some good instincts. Here's a secret: I've got some decent instincts myself from parts of my life I've never told you about."

Her expression turned thoughtful. "Donny mentioned a few things. The army paid your way through college, didn't it?"

"My son talks. A lot. Did he mention they had me on a bomb squad in the Mideast? And right now, on the back of my neck, I feel something I haven't felt since a *real* close call in Syria: a cold spot smaller than a fingernail. Get *out* of here. Call in sick if you have to."

"I can't do that. Look, if it makes you feel better, we'll stroll past the shed and we'll see if my, um, cop-sense tingles."

"Don't do that! If you won't leave, for God's sake, at least send one of the uniforms to ask questions. Or ordinary park security."

She shook her head and her long dark curls, so like her daughter's, followed her head movement like an afterthought. "And let the doers know they've attracted official interest? I mean, just on the very farfetched chance something illegal *is* happening?"

I knew it was time to shut up and I did. But I had plenty of time to worry because we weren't going anywhere at record speed. Evie was fascinated by everything from the art-glass demo, to a hideous squeakfest surrounding a perpetrator of balloon animals outside the glassblowing tent, to an unfortunate individual boiling to death in a Big Bird costume, et very much cetera.

So we were still twenty or thirty yards from the power shed when I felt a tug on my arm.

"I deeply regret bothering you, *amigo,*" Lopez said from either two feet or twenty miles away, depending on viewpoint. "But my surgery awaits, and the nurse will be here pronto. No, you needn't leave your loved ones."

I disabled the x-change system and pulled off the glasses anyway to see my friend.

He was beaming at me. "Since anesthesia general," he continued, "has risks we both know well, I wished to say good-bye and give you my blessings and love beforehand."

"Juan, you're going to be fine. You have to be, for both our sakes. Honestly, you're the only thing that's made this place bear-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

able this last year."

"My life is not entirely in my hands, Fred, but I will survive if offered a choice. You have been a great joy to me as well. So I have one more foolish maxim to offer you if you will permit. You needn't make a face so sour! Your Horton's Laws were the inspiration for my maxims."

"Ha. The difference is that *my* rules are practical."

"The difference is my maxims are true." He smiled to take the sting out of it, but I was a bit stung anyway.

"Name one that's false."

"Your first Law, *por ejemplo*. Conservation of Misery you call it, no?"

"Right. Misery never actually vanishes; if one part of your life improves, some other part—"

"I understand your concept, *amigo*, but it does not fit my experience."

"All right. Every rule has its exceptions and I admit you're exceptional. So what new truth were you going to lay on me?"

"One to explain why you will do beautifully even without me. Perhaps you remember that I once earned my pay as a *carpintero?*" Despite minimal formal education, he'd uplifted his career from subsistence fishing to rough framing to being one of LA's most popular private contractors. "So it is natural for me to see the human spirit as a building, a *special* house that becomes *más*—more strong through the years, even as the body weakens."

"Nice image, Juan, but what's your point?"

"A wise person comes to know which walls are load bearing and which can be torn away without harm. At our age, *amigo*, we need very few walls."

After Lopez had been wheeled away by Nurse Bob, heading toward the surgical end of the hospital, which most of us inmates call the "wrecking yard," it dawned on me I hadn't warned Evie or Amanda about my latest departure. So I hurriedly pushed the glasses back in place and returned to my family. Apparently no one had missed me, which might've been a trifle ego-denting, except we were back in the sunlight, which made my face or its absence easy to overlook. Besides, I was too concerned about Lopez to brood about anything petty. This was the third time he'd gone under the knife in the last five months, both for adhesions and to drain some fluid build-up, but he'd never supplied such a formal farewell. I'd learned to respect the man's intuition, maybe a little too much, and had the miserable feeling I'd never see him again.

So between heartsickness and checking on my granddaughter, it took me a few moments to realize we were only a few yards from the chainlink fence surrounding the big shed.

"What do you *suppose* is going on in there, sweetheart?" Amanda prompted Evie. "You could ask those two guys if you want to."

"I will, Mommy."

Two heavyset men in gray coveralls were smoking cigarettes in front of the fence's closed gate, its massive padlock open and dangling from the highest link. As we moved past the first DANGER: HIGH VOLTAGE sign, I could see how hard these boys were puffing, perhaps trying to suck tar past the anti-cancer filters. They eyed us warily, and I could almost smell the nervous sweat.

My daughter-in-law was no fool. "We'll ask them later, sweetheart," she said, taking a sharp left turn and dragging along her little girl who was too surprised to protest. "First, let's go back to the petting zoo! I think you missed one of the lambs."

X-change paint uses any surface it's sprayed on as both a loudspeaker and a piezoelectric audio pickup. It makes a much better pickup than a speaker, but the stereo imaging is limited. So I was only sure the husky, polite male voice was coming from behind us because I couldn't see who was talking.

"Officer Horton, I have a hidden gun with a quite remarkable silencer pointed at your child's head. Don't turn around." The phrasing almost sounded British but without the accent. Instinctively, at the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

first few words, I'd punched the display button on my remote, erasing my face from the balloon but maintaining my sensory contact with the fairground. One of the maintenance men pulled the gate open.

"Walk through," said the un-Brit, "then fast through the shack's door if you want her to live."

Someone opened the door ahead of us, just barely wide enough to accommodate my balloon, and I got the briefest glimpse of a curtain ahead made of layers of hanging black plastic strips and the trailing arm of a person just disappearing through it. Then the door slammed behind us, and I couldn't see a thing. "Now push through the screen and I'll tell you when to stop walking," the voice commanded with an unpleasant gentleness.

A moment later, "That's far enough."

The shed's interior was cave-dark and for one long moment of pure stupidity, I waited for my eyes to adjust. I heard several voices talking at once, rustling noises, and the unmistakable sizzle of ripping duct tape—also a continual ambient sound, part hum and part buzz. Finally I got smart enough to push the auto-contrast control on my remote, triggering the photomultiplier function. Suddenly, the plywood sheets blocking off the shed's two windows were oozing light like thin porcelain, and I could see. Three men wearing compact night-vision goggles were with us, not counting whoever had forced us in here.

A huge goon with obscenely long arms was holding the silver brooch Amanda had been wearing all day. Another goon had stolen her purse and had pulled her .38 from its concealed compartment. He casually placed weapon and purse on a nearby shelf as the third forced Amanda's wrists behind her back and wrapped them in layers of tape. Her ankles were already bound. Evie's eyes were huge, and she remained unnaturally silent, even when the tape man bound her wrists in front of her.

When they'd finished making my family helpless, the trio of creeps strolled over to a folding table near one wall, sat down in folding chairs, clapped on headset phones, hoisted small control boxes of some sort, and started up low-voiced conversations, presumably not with each other. I boosted my audio feed momentarily, but the only thing I learned was that the three weren't telemarketing. Their talk was incomprehensible, filled with grid this and grid that, and familiar street names in downtown L.A. and Beverly Hills.

From inside, the shed was roomier than I'd expected, despite holding so much equipment. The fairground evidently had dual power systems. A low voltage setup involved chargers, voltage-regulators, and an extended bank of deep-cycle batteries hung in two tiers—probably for the miles of strung lights outside. Hundreds of thin color-coded insulated cables running in neat lines were stapled to the wall, and dozens of small metal boxes were spliced into this highway of wires. The boxes seemed as appropriate to the system as leeches on a human leg, and the many bright splashes of solder hinted they'd been added recently and in haste. On the high-voltage end, a massive bus fed two major-league Toshiba transformers isolated behind steel meshwork, output cables vanishing beneath the concrete floor but surely leading to the amusement park area with its Ferris wheel and rides. For backup, a heavy-duty gas-powered generator squatted near the rear wall, escorted by a gang of truck batteries. Lawsuit avoidance, I guessed. Wouldn't do to have a ride freeze up should city power brown out or fail completely.

Here and there, little pieces of black electrical tape were stuck to surfaces. Covering the ready lights? The goons wanted the place *dark*, and the possible implications chilled me to the core. Had they been planning all along to kidnap Amanda and were making sure she couldn't see their faces? But if so, wouldn't masks or disguises have been far easier

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and cheaper?

A laptop resting on the shelf with Amanda's possessions had a widescreen displaying a large green outline, rectangular except for its pointed top, and a host of scattered red dots with a few blue ones; the display must've been dimmed to the limit, it was a bit bleary even to my augmented vision, and the dots flickered as though about to gutter out. A box with a large hole in one side sat between laptop and purse, probably how our host had kept his weapon inconspicuous. A cheap condenser microphone was half hidden behind the laptop.

All this attention to detail wasn't just an old engineer's habit. It was my only way to keep panic at arm's length. Even so, my heart was racing fit to burst, and my hands were colder than ice.

"Mommy, I'm scared."

Eve's little chin was trembling, and the sight broke though all my defenses. Without removing my glasses, I fumbled around until I'd grabbed my bedside phone. My fingers were twitching to press 911, but something between fear and intuition made me hesitate.

"Mommy's here." From reserves I couldn't imagine, Amanda managed to keep her voice soft and soothing. "Don't worry, Evie, everything will be all right."

"If you behave yourself, Officer, everything *will* be all right," said the husky voice. "But I must warn you. We lack time to search you properly, although my . . . employee Jimmy always enjoys such opportunities." From the table, Gorilla Arms turned and grinned beneath his goggles, and I was glad Amanda couldn't see it. "Hence, you may have a concealed means of communication aside from that too-obvious broach, one that might not require the use of hands. If so, I would *strongly* suggest you not use it. Be advised: we are all wearing state-of-the-art nocturnal vision devices, which use x-change-type nerve induction to provide ideal clarity. Even if we fail to catch you in the act, we are monitoring these grounds intensely and have, ah, an associate or two at your police department. I see you shaking your head, but I assure you it's true. How would I have known your name and occupation otherwise? You will come in handy to aid in negotiations when we reach that point, but are hardly indispensable. The moment I receive word *any* authorities have prematurely become aware of your situation, you and your daughter will die."

"Who are you? What do you want?"

"You may call me Mr. Blunt. Please sit down and make yourselves as comfortable as possible. We shall be here for some hours yet. I've a few things to do at the moment, but I promise we'll have a little chat soon." He moved forward and I could finally see him. Tall and very thin with a narrow but protuberant nose. On him, the coveralls somehow appeared almost elegant. His eyes were hidden behind another pair of goggles.

He turned away, then turned back as if struck by an afterthought. "I should also mention how well this building is soundproofed to kill noise should the generator kick in. Still, I would appreciate silence on both of your parts and I suggest you take every least whim of mine most seriously." He whirled and stepped up to the laptop; a moment later I heard the faint swishing of someone using a touchpad.

"I can't see, Mommy!"

"I know, sweetheart. Sit down with mommy and cuddle up close. It's very important for both of us to be very, very quiet."

As they lowered themselves, Amanda swung around so that her back was touching her daughter's side. I didn't understand what she was up to until her hands, bound at the wrist but still able to grab, worked their way down Evie's arm far enough to snag the string. She turned to face forward and pulled my balloon close to her head in one smooth movement.

I was asking myself a key question: did Blunt know about me? Was it coincidence he'd used the word "x-change"? Was his threat aimed only at Amanda or was he

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

also making sure I didn't dare act? He'd obviously been following us, but x-change faces are hard to see at any distance, particularly in bright light. And I'd had the system disabled while my loved ones were walking to the shed. *And* I'd flipped the picture off the instant Blunt started his abduction routine. The gate goons hadn't even glanced at the balloon. The purse-snatcher hadn't, thank God, seemed to notice the small spraycan. Maybe they didn't know.

But in either case, I might be able to do something. The question was *what*. Contact the FBI? No, couldn't be sure *they* wouldn't call the cops.

I noticed a murmuring just at the edge of audibility and boosted my audio. Amanda was repeating, "Fred, can you hear me?" I could, but it wasn't easy. Her words were slurred because she was barely moving her lips and the amplification was boosting every other sound in the room.

Speaking so quietly I was confident the ambient hum-buzz and the trio of phone conversations would keep anyone farther than a foot away from eavesdropping, I said, "Okay. I hear you." She didn't react so I said it again just a tad louder. That did the trick.

"Fred, thank God. Can you *see* anything?"

"Everything, dear. I've got the—"

"Anyone watching me right now?"

"No. Blunt's fiddling with a computer and the others are on phones."

"How many others?"

"Three. The one called Jimmy has to be the missing link and there's . . . Thing One and Thing Two."

"Where's my purse?"

"On a shelf about ten feet in front of us, and your gun's right next to it. Thing One seemed to know exactly where it was."

"Oh sh—" she cut herself off, probably remembering Evie. "Anything behind me I can use to free my arms?"

"I don't—actually, yes! If you can scooch over about two feet to your left and back up just a bit."

"Nothing I'll bump into on the way?"

"No. You're clear."

Amanda leaned over and whispered into Evie's ear. A moment later, the two of them slowly wriggled to the side, stopping often so the balloon would float back to where I could supply new instructions. Within two minutes, they'd reached the right spot.

"What now?" Amanda asked.

"Immediately behind you, a battery is hanging from a metal strap that's edge-on to you and about the right height. I doubt it's very sharp, but the strap's thin so the edge should eventually cut the tape if you can force it between your hands and wiggle your arms up and down."

"I'll try. First let's see if I can work this string under my butt; I don't want us to lose contact." Her hushed voice remained steady.

"Amanda, I've got to say. I knew my son had done well, but I hadn't dreamed he'd done *this* well. I'm proud of you. And Evie too. You've got real courage."

"I wish. But your being with us makes all the difference." She rocked forward and managed to pin the string under her rear end on the first try. Then she extended her arms backward until they touched the strap, a little lower than I'd hoped but high enough to get decent friction if she was flexible enough. Before she could try my idea, Blunt left his laptop and headed our way.

"Amanda!" I cried. "Freeze!" Nothing wrong with her reaction time. "Blunt's coming back."

He stopped a few feet away and squatted down. "Now, Officer, I will explain your role in today's operation." His voice was painfully loud in my ears until I turned down the audio.

"What are you, Blunt? Some kind of terrorist?"

He chuckled. "Hardly. I consider myself a . . . creative entrepreneur. One very near retirement thanks to the proceeds you will help us earn."

"Why do you keep it so *dark* in here?" my granddaughter blurted. "I

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

don't like it."

Blunt frowned. "You're the youngest daughter, aren't you? Eve, as I recall."

"I'd like to know about the darkness, too," Amanda said quickly when Evie didn't respond. "Why go through so much trouble?"

"I doubt the girl is old enough to understand such things, but in the spirit of cooperation, I'll tell you both. The answer is *efficiency*. Efficiency is my personal god. More thought, effort, and time has gone into this than you might believe and I've polished my plan to the finest grit."

"So you're the one running the show."

"I see no harm in admitting it. Returning to the girl's question: since we've needed to work between county inspections, we've had to do considerable work in this shack over the last few nights and couldn't risk any light showing should anyone . . . unauthorized pass by."

"Even with your blackout screen?"

"We only put that up this morning and largely for your benefit. Wouldn't do to have had someone nosy and clever glimpse something so odd when we've needed to open the door. You must admit, the darkness keeps you conveniently harmless and ignorant, doesn't it?"

"You weren't worried about the night security guards hearing you?"

"Ah. You're a bit clever yourself, aren't you? I must bear that in mind. Of course, you're right. I own both Manny's Maintenance and the Confidence Security Agency. No harm in your knowing that since both organizations will evaporate shortly. I think that will be enough questions on your end."

"Can I make one comment?"

He stood up for a moment, rubbed his knees, and returned to his squatting position. "Just one and only due to my single vice: curiosity."

"If you're expecting to retire on what you'll get by holding us hostage, I'm afraid you're going to be disappointed. The LAPD has a policy—"

"No, no. Now I'm disappointed in *you*. I intend to hold every single soul in this park hostage, and we'll see how well your *policy* holds up. Almost all is in place, but we're waiting for the peak hour, when the grounds are sure to be busiest."

"How can you expect to hold that many people at gunpoint?"

"Gunpoint? We'll be relying very little on guns."

In an unpleasant flash, I understood the outline on the laptop screen. It represented the fairground's perimeter. The dots had to be bombs. And something else began nagging at me, which I couldn't pin down.

"Sometime within the next several hours," Blunt continued, "I will push a button on my phone and then hold the phone to your ear. You will find yourself talking to an operator at your police department. At that time, you will say nothing on your own but will simply repeat whatever I tell you to say. Word for word. The smallest deviation, particularly when it comes to the numbers of certain overseas accounts, will result in—let's say considerable grief for you. Do you understand me?"

"Yes."

"Good. Do not speak again until I tell you to."

I've never experienced time passing so slowly. Amanda worked on cutting her wrists free, and I worked like hell trying to figure a way out of this mess. Something about the image I'd seen so briefly on the screen was still bothering me, and I still had no idea what. And the minutes barely crawled. Blunt kept tinkering with something beyond my view on the shelf behind the laptop, and the three stooges blabbed constantly into their mouthpieces. At the hospice, a nurse came into my room and went away when I told her things were just dandy and I was busy.

"Boss!" Thing One called out, startling me and making Evie emit one forlorn cry. "We got a problem."

"I see that. Why, if I may ask, is grid ten suddenly filled with blue lights?"

"You know that excavator behind the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

carousel? Some punk just moved it to grid nine. With the backhoe down. Took out most of our remote—"

"Unbelievable. It's the bloody *weekend!* Canapka Construction doesn't work weekends. They barely work at all!"

"Easy, boss. Wasn't Canapka. Some smart-ass kid hot-wired it and took it for a joyride. With our security team tied up getting ready for crowd control, we don't got enough—"

"How many technicians can we put on this?"

"Um. I don't know." Despite an obvious attempt to sound tough, his voice quavered.

"Then would it be too much trouble to find out?"

Thing One hastily punched buttons and had a quick discussion over his headset. "Only four, boss, unless you want to pull anyone off the fence crew or have fewer watchers."

"No. But four isn't enough. It seems we're going to have to pitch in and get our own hands dirty. We'll leave Jimmy alone to hold the fort."

"But boss—"

"Is that all *right* with you, J.C.?"

"Of course, sir." Textbook sullen.

"And what about you, Zack? Can you bear to leave your station?"

"Sure."

"Officer Horton, you sit tight and keep your girl quiet. Jimmy, what you do on your own time is your business, but right now you keep your mind on *my* business or I'll shoot you myself. Got it?"

"Yeah. No problem."

Blunt and his Things stepped through the plastic curtain as if it was an airlock, and I heard the door open and slam shut.

Then we were alone with the Missing Link.

For a while, the Link ignored Amanda and became embroiled in a phone argument with someone called Eric who apparently wasn't pushing his team hard enough to get whatever work they were doing completed on time. Eric, I gathered, couldn't figure out how he was supposed to increase his pushing while Jimmy was keeping him tied up. I began to think Jimmy wasn't going to be trouble after all. Big mistake.

I used one of those bells, or perhaps whistles, of my police-issue x-change receiver to photograph the laptop's screen, wishing the system had a zoom function. Checking the recorded image, I was relieved to find the dots clear enough to provide a detailed map of where every bomb was placed. For backup, I sent the image to Amanda's e-mail account and my own before switching back to a live feed and, for the first time, really studying the screen. The issue nagging my back brain practically jumped out at me.

A profusion of red dots glimmered *outside* the fairground, spread in a wide crescent near the front gate. I wondered uneasily why they'd mined that particular area and closed my eyes to think it through.

An impressively high and strong-looking chainlink fence enclosed the entire park. Even if the main gate were closed and locked, it would be still be the weakest part of the fence, the logical place for a SWAT unit to mount an assault. Once Amanda relayed Blunt's instructions, the entrance area would surely be swarming with cops—Lord! Probably *every* available cop in the county, an FBI contingent, various assault vehicles along with the usual police cruisers, maybe even National Guard soldiers. If his bombs packed enough wallop, Blunt could wipe out most of L.A.'s law enforcement structure in an instant! Something told me the man had bigger plans than just holding the local crowd for ransom. . . .

I opened my eyes and found Jimmy staring at my daughter-in-law. He remained on the phone, badgering someone new, but his gaze kept shifting between the plastic-strip curtain and Amanda's chest. He shifted his chair in tiny increments, seemingly tugged by magnetic surges until he was facing her directly. Amanda's breasts were bouncing

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

as her arms worked at abrading the tape, but apparently the Missing Link didn't realize what she was doing, or didn't care.

When the Link got to his feet, his chair creaked and Amanda froze. "What's happening, Fred?" she asked.

"Jimmy's walking toward you. No, keep working. I'm afraid you're going to need your hands."

At close range, the man appeared positively subhuman. The headset seemed as out-of-place as it would've on a gorilla. He sat down in front of Amanda, close, and stretched out a long finger to gently tap the top button of her blouse. She shrank back, but had no place to go.

For the first time in a long time, Eve spoke. "Something smells real bad, Mommy."

Jimmy turned slightly, tugged off his headset, and tossed it behind him. Without warning, he moved faster than I'd ever seen anyone move, lashing out with one of those ape arms to backhand Evie across her forehead. The blow cannoned her skull into the concrete wall behind her, and my little girl slumped over sideways as if her bones had liquefied.

"What have you *done?*" Amanda cried. "Evie?"

"Don't you worry 'bout her, pretty lady, she's breathing okay. But if you're not *real* sweet to me and keep your mouth shut tight afterwards, I'll stomp her neck flat. Maybe I should do that first. . . ."

"*No!* I'll do whatever you want. Just don't hurt her."

"You and me gonna have some fun."

Something more solid than rage moved through me, pushing through my horror and shock. I wanted to hurt this monster, and I suddenly knew how to go about it. I reached for the flash dial on my remote. Just in time, it occurred to me the sudden brightness would hurt Amanda too. Then I started shaking. I'd come *this close* to blowing a real chance to rescue my loved ones. I refused to think it might be too late to rescue Evie.

My knowledge of night-vision goggles was decades—hell, over a half century—out of date. But if Jimmy's goggles had the kind of automatic filtering built into my x-change system, he might've had no more than a moment of discomfort. And then he would've known about me for sure. Even the best auto-filters take several dozen milliseconds to work. If I wanted to put Jimmy out of commission for long enough for Amanda to get the upper hand, which I wanted with all my heart, I had to produce a light so damn bright it would blind him for at least a few minutes in that one instant.

And I had a way to do it! But I had to warn Amanda first. And I wasn't at all sure my body was strong enough for the job.

The Link was panting now as he unbuttoned Amanda blouse. She was wearing a soft-looking bra underneath, and he tugged on one cup until one breast was free. He started poking at her nipple like someone trying to spear a fish, no longer bothering to even glance toward the doorway.

I tilted my x-change glasses to uncover my left eye, put the TV remote on my pillow, and forced myself upright onto the floor. The glasses slipped back into place with the motion so I bent the frames to keep it from happening again. One eye in the shed and one twenty miles away in my room, I took a deep breath and got to work.

My plan required getting the x-change camera as close as possible to the wall with the TV, but the camera was attached to my bedframe and the damn hospital bed seemed to be glued in place. You idiot, I told myself after a few futile pushes, the wheels must be locked.

Sweat pouring off me in sheets, I had to stomp repeatedly on each of the four wheel levers before the bed was ready to roll. And then I *still* couldn't get the damn thing to budge!

Jimmy had one hand pawing between Amanda's legs now while the other was fumbling with her belt. I heard myself swearing, even over the Link's heavy panting and little chuckles.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

If only Lopez were here! I didn't dare call for help from anyone else. One thing you don't get at Saint Teresa's when you're old and sick is respect. Any nurse that came in would have to be convinced I knew what I was doing—which would take too much time at best. At worst, they'd insist on calling the police.

I shoved with all my energy, and the bed moved maybe an inch.

And then it was all over. With the first rattle at the door, Jimmy was moving with insane speed. He managed to get Amanda's blouse partly buttoned and was back in his position at the table as Blunt and Thing One pushed through the plastic strips. Jimmy wasn't just brutal, he was stupid.

Blunt pulled on his goggles and took one quick glance around the room. His gaze froze when he came to Evie's unconscious form.

"Jimmy, lad," he said very softly, "I'll be dealing with you later. Right now, I'm advancing the schedule to avoid anything else going wrong. J.C., kindly hand me Zack's headset and put yours back on. Our guest will be using my phone. The minute Zack tells me he's finished, I'll have you order the fence crew to close the gates. Jimmy, at that point you'll notify our associates downtown. The rest of the operation, I'll handle myself." After donning the headset, he moved the microphone in front of his laptop and mumbled for a time. Probably rehearsing his threats for the fun-loving crowd outside.

I couldn't bear it. Was one old man's weakness going to kill dozens, maybe *hundreds* of people? But every day for months now I'd proved how feeble I'd become, hardly able to drag myself to the toilet. Two years ago, I could've *carried* the damn bed. Stupid old man tears kept merging with the sweat on my cheeks. . . .

I can't explain what happened next, but I swear it happened. Clear as though he was standing right next to me, I heard Lopez repeating one of his little platitudes.

"The past is a sea anchor, *amigo*. In a storm terrible, it can hold your ship steady and preserve your life. At other times it is only a drag."

For the first time, I understood what he was getting at. It wasn't just the bed resisting me, but the accumulated weight of everything I'd learned about my cancer and chemo-induced physical limitations. It didn't matter how weak I'd been last week or yesterday, or even a second ago. What counted was right now, and right now I had to move the bed. No matter what. Which meant I had to *believe* I could do it.

After the thing really started rolling, it was easier to keep it moving. Then it banged against the TV with a loud crash, and I was terrified something had broken. But when I grabbed the TV remote and pressed the button, the unit came on instantly, the menu appearing much too bright but UHD-sharp. I flipped to the test channel and boosted the brightness all the way, forcing me to squint to find my x-change lens, which I turned to face the blazing screen.

I preset the luminance control on my x-change remote to the max, pulled the mic near my mouth, and spoke quietly.

"Amanda, how you coming with the tape?"

"It's cut, but I don't know what good it will do me now that Blunt's back. How is Evie?"

"Still sleeping and still breathing. Listen carefully. When I say 'now' I want you to close your eyes as tight as you can and cover 'em. I'm going to make one hell of a flash. If it bursts the balloon, and it probably will, get that tape off your ankles, then stand up facing exactly the way you are now. Take maybe thirteen or fourteen short steps straight forward keeping your arms just a bit ahead of you, but very low. With me so far?"

"Yes."

"Good. When you get near the shelf, you'll feel a rubber pad under your feet. At that point move to your right about three feet, which should put you safely past the laptop. We don't want you touch-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ing that laptop! Reach straight ahead slowly and feel around, about your shoulder level, until you find the shelf. Then slowly work your way to the left until you locate your purse. Pull out the paint can and just spray it anywhere on the shelf. That way I can make a light for you. Got it?"

"Got it."

"Evie's going to be fine and so are you. I love you. NOW."

I disengaged my auto-contrast function and barely remembered to shut my own eyes as I punched the display button. Even then, the light in the shed stabbed like a dagger, turning the inside of my right eyelid sun-bright yellow until my filters kicked in. My left eyelid merely turned a blazing scarlet. Stupid of me not to have taken my glasses completely off. I'm sure I made some kind of noise, but it was drowned out by three truly horrific screams. With the x-change projection multiplying the TV's brightness, God knows how many times, I can't imagine how much candlepower hit that room. But somehow it didn't burst my bubble.

I turned the TV off, dialed the x-change luminance way down but still bright enough to illuminate the room, and repositioned the lens toward my face. Blunt and company were flat on the floor. Jimmy was groaning and thrashing as if his clothes were on fire, but the other two were lying still as death. Then, mercifully, Jimmy went limp and silent.

Amanda rubbed her eyes and gave her former captors one long cold stare. "What knocked them out, Fred? Sheer pain?"

"Could be." Their night-sight gear wasn't anywhere near them, sign of how desperately they'd clawed the devices off. Maybe their "state-of-the-art" gear hadn't had auto-filters after all. . . .

I spotted one pair of goggles in a corner and I knew. "More than pain, I think. Blunt bragged about how his equipment uses direct nerve stimulation, right? Look just left of the generator. See the goggles and that smoke coming off the battery module? Even with a low-voltage power supply, the overload must've given these boys one hell of a shock."

My wonderful daughter-in-law shook her head, unwrapped her ankles, and leaped to the shelf, dragging me along. She grabbed her gun and pulled her cell phone from her purse, then hurried back to Evie, laying the weapon down within easy reach. Since she was directly beneath me I couldn't see Amanda's face, but after too long a moment, I heard her sigh. She pulled me down and close.

"Her heartbeat's strong, Fred. And her color, far as I can tell by your light, doesn't look so bad. But we've got to get her to a hospital." She flipped her phone open.

"Wait, Amanda! I want Evie checked out as much as you do, but we've still got a situation."

"I know it. If all private security and maintenance here is on Blunt's payroll—"

"There's worse. See that laptop? What you can't see with naked eyes is what's on the screen. While my vision was boosted, it displayed a diagram of the park and an army of red dots."

She frowned. "Dots representing perps?"

"They never moved, so I doubt it. Remember what Blunt said about not controlling the crowd with guns? I'm afraid each dot means some kind of explosive. Amanda, I counted more than twenty *outside* the front gates."

"That's . . . oh. Oh my God . . ."

"Exactly. I figure Blunt was using this fairground stunt as a—a stepping stone. He would've had you make that ransom demand and then waited until every cop within a fifty-mile radius was on the way. Then he'd get the gates shut, patch that crappy microphone into the local PA system, and warn all paying customers to keep still or else. Maybe set off a bomb or two to underline his point."

She glanced at the unconscious men and I wouldn't have cared to be on the receiving end of that look. "I'm not sure you got the order straight, Fred, but I'm buying your list of events. And when the cav-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

alry showed up, Blunt would've blasted them to shreds. And you heard him mention some . . . associates downtown? Enough 'associates' and they would've had an easy shot at the banks and jewelry stores and—but you don't think the bombs are *still* a problem?"

"They might be. I'd assume the laptop is set up as a remote detonator. But I can't believe anyone who planned something this elaborate would put all his eggs in a—a wireless basket. So I'm thinking there's a hardwired backup, and I'm just praying it's in *here*. Another thing: a man like Blunt would've wanted individual control over each explosive, which rules out radio-triggered detonation from one central transmitter—too many bombs involved."

"Don't you—"

"Now I'm just speculating, but see all those little boxes jurygrigged to wires on the wall behind you?"

She turned briefly. "So?"

"My hunch is that each wire goes to a specific string of lights and can be used to carry specific signals. Also, I read an article last month about these new induction triggers. Maybe some of the lights themselves have built-in—"

"Fred! Theorize later. What should we *do* about this?"

"Sorry. You're right. Hey, could we barricade the door somehow, maybe jam a chair under the knob?"

She gave the folding chairs a speculative look, then sighed. "Might work, might not. We'd better not take the time to experiment."

"Then get me close to that laptop, but not close enough to bump it by accident. And do *not* touch it yourself, not until I say when and how. Particularly avoid the keyboard."

"We are going to shut it off?"

"Better to go an extra step and disable it completely. Which I suppose could mean losing some evidence, but at least I already took a picture of everything on the screen. So we'll know exactly where to dig up the bombs."

"That's good to hear."

"All right. After I get a good look at that machine and see what kind of peripherals or memory cards are plugged in, we'll turn this place upside-down if we have to—I mean you will—until we find another controller or we're positive it's not here. Meanwhile, maybe you could dream up a plan for handling Blunt's people outside? They must be getting antsy by now."

"No dreaming needed . . . Dad." She'd never called me that before, although I'd often asked her to. "There's only one sensible way to deal with this kind of situation. Isn't it obvious?"

Not to me it wasn't.

If it hadn't been such a relief, finding the backup controller would've been almost anticlimactic. An old-fashioned breadboard festooned with a jungle of wires and hundreds of micro-switches was right there on the shelf, lying flat behind the laptop, not even hidden when you were close enough to that wall. Amanda also spotted a small toolbox containing the usual soldering equipment, including wire-cutters. I studied the home-baked circuit, cramming for the most important test of my life before having Amanda shut down the laptop and pull out its battery. Then I issued step-by-step instructions for gelding the breadboard. Amanda's hands were steady and precise as she cut the primary hot leads. But that wasn't the only reason I was even prouder of her by the time we finished. From my own feelings, I could guess how urgently she wanted to get her daughter medical attention, but she'd only glanced at Evie twice while we were working.

And she didn't give the curtain of strips even a single look, although she was probably as scared as me about one of Blunt's men coming in to check on the sudden lack of communications. But with possible dirty cops infesting the LAPD—or moles or whatever you're supposed to call such vermin—we didn't dare cry for help without first defusing the explosives.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

No saying what kind of help would've showed up.

But the instant I told Amanda the bombs had been neutralized, she began making calls to her fellow officers on fairground duty, contacting cops she trusted the most first. Apparently she didn't care to risk any general announcement over official frequencies, so she punched in cellphone numbers, briefly described the situation, and commanded the surprised individual on the other end of the line to reach the power shed ASAP to stand guard. After six such conversations, she called for two ambulances and only then contacted her watch commander.

August 18, 2028

Got a heap of news to report so I'll put it in three columns: good news, news I'm not sure how to feel about, and the bad.

For me, the best part was when Evie woke up in the ambulance, outraged we weren't headed toward the petting zoo. She seems to have forgotten everything that happened in the shed—maybe for the best. The doctors kept her overnight for observation, and Don, my middle son, joined Amanda and me at the USC medical center, keeping Evie company all night in her hospital room. Well, to be honest, Grandpa was napping half the time, but I never took off my x-change glasses. In the morning, the doctors released Eve but cautioned us to keep alert for any odd behaviors, slurred speech, and the like. Of course, I'd already planned to keep a remote, although close, eye on her. The human brain is about as tough as a ripe avocado and the long-term effects of concussion are unpredictable.

More good news: Amanda's plan for handling the fairground crisis worked perfectly. No one was hurt or taken hostage or even bothered. Her basic idea, based on SOP in similar situations, was to do nothing but observe. And, I imagine, do some fancy tracking by satellite. The police had cordoned off the power shed but hadn't immediately arrested anyone outside the shed. I wasn't around to see it, but apparently after an ambulance had taken Eve, Amanda, and me away, and a more military kind of ambulance had removed Blunt and the two Things, every member of Manny's Maintenance and Confidence Security, one by one, drifted casually through the front gate and drove off. I understand about thirty of the conspirators have already been captured and are awaiting trial. And there's a former police dispatcher in the same jail.

In column two, Blunt and his buddies are blind. Permanently. I'm sure Lopez would feel great regret if he'd been the one who'd ruined three pairs of eyes, but while I'm trying to be more like Lopez, I'm not there yet. Not saying I'm overjoyed at this result, but I sure as hell would do the same thing again in the same circumstances.

Also in the gray column: I've been deluged with a storm of publicity, and I hear more and heavier is coming my way. Newswebs, newspapers, and TV news programs are already full of inflated descriptions of our little ordeal. Apparently, I'm something called a "hero," a word that evidently means a person with no right to any privacy. Supposedly, offers are about to flood in for everything from exclusive interviews to movie rights. I'll probably milk it for all it's worth—my children could use the money. And rumor has it the governor is coming all the way from Sacramento to shake my arthritic hand. I can't wait.

Then there's the bad news. No, not Lopez. I forgot to put him in the good column. He's good; in fact his doctor's are scratching their balding heads about his condition. The surgery showed that while he hadn't exactly gone into remission, his cancer's rate of growth has slowed to a crawl. Figures. I'm going to ask him to teach me some of that Qigong.

The bad news is that we're not leaving this hospice alive, Lopez or me. Maybe we'll hang around for longer than anyone expects, as Juan already has, but we're still dying, however slow the process. But then, aren't we all? ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

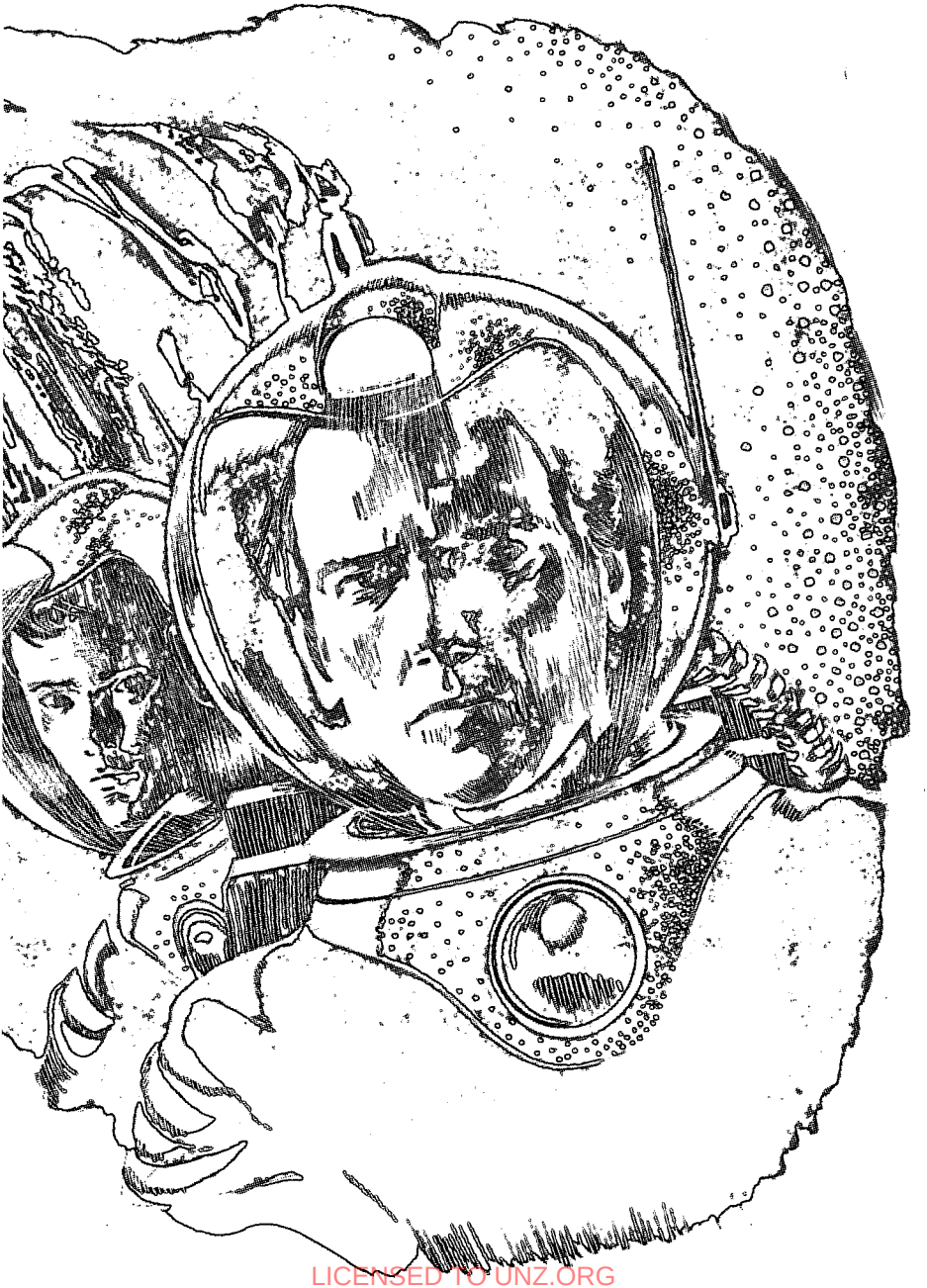
A Zoo in the Jungle

Carl Frederick

Illustration by Vincent DiFate

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The real purpose of a tool is not always its most obvious application . . . .



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

As Yevgeny drove the moon buggy toward the distant wall of the crater, Arthur Davidson, sitting beside him, stared away at the Earth looming large just above the rim. Had he been home in New York, Arthur would be celebrating his twenty-eighth birthday about now. Not that it would be much of a celebration; as a loner, he had few friends, and, a half year earlier, his mother had died. Yet her passing had supplied him the emotional freedom to follow in his father's footsteps—but hopefully, not too closely in them.

Arthur lowered his gaze to the crater wall, its unrelenting blackness a silhouette against the star-pricked blackness of the sky. Somewhere near that wall some nineteen years ago, on the last lunar mission, his father had disappeared. As soon as he was old enough, Arthur applied to the space program and, probably out of respect for his father, they'd accepted him.

Now, despite his youth, here he was on the Moon, a part of the joint U.S./Russia expedition. He knew he had his father's reputation to thank for that. Of course, it helped that he was proficient in Russian.

With its lights off to conserve power, the buggy's large wheels rolled over the lunar landscape. The white-gray interior of the crater reflected a soft bluish tint from the bright Earth above, while basketball-sized rocks cast black shadows with fuzzy borders.

"You are as quiet as Moon," said Yevgeny in English.

They conversed in English both because, as Yevgeny said, "You not need practice Russian. I need practice English," and also because Commander Drummond said, "It makes me nervous when people speak in languages I don't understand," which meant any language other than English.

"You concerned about what we find?" Yevgeny added after a few seconds.

"No, Zhenya," said Arthur, using the Russian's nickname. "My father died as he would have wanted—for the sake of science and exploration." He wondered if he was just idealizing his father. When Arthur was six, his parents had divorced and, despite his protestations, his mother had been awarded sole custody. He loved his mother, of course, but he always felt the loss of his dad.

Yevgeny nodded toward the disk of the Earth. "I not think Mission Control considers this science mission." He threw up a hand. "For nineteen years, nobody care about Moon, but now . . ."

Arthur blew out a breath in his helmet. He appreciated that it would sound like a gale when transmitted to Yevgeny's transceiver. "I know. As long as we set up a base before the New Arabia mission arrives, they'll be happy. But I really wish we had a more substantial mission."

Yevgeny shrugged. "How many people you need to plant flag?"

"Claiming the Moon." Arthur balled a fist. "It's stupid. It'll lead to war." He let out another breath, this time through his nose. "But as for exploration, space is the only game in town."

"Only game in town?" said Yevgeny, turning his helmet and giving Arthur a quizzical expression. "Not understand."

"Sorry." Arthur explained the idiom, then looked off at the blue-green disk. "Earth is like a jungle these days."

"Worse," said Yevgeny.

"Oh, humanity will grow up."

"Or go extinct."

"I have faith in the future," said Arthur, his words sounding to himself more like a wish than a belief.

"I have faith in future also"—Yevgeny switched on the buggy's lights—"just not in near future." As the buggy pressed forward, the crater wall rose to cut off the view of the Earth. Except for where the buggy's lights pointed, they could barely see the shadowed ground.

"There!" Arthur pointed to where, in the distance, a glint of metal reflected the buggy's lights.

Yevgeny adjusted his course by a few degrees and, gradually, the far glint re-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

solved into another moon buggy sitting near the crater wall.

"Amazing," said Yevgeny, halting his vehicle near the lifeless buggy. "Twenty years old and it look identical to this one, and just as new."

Arthur jumped out of the vehicle. "I imagine it *is* identical," he said, "except that it couldn't be controlled remotely." He shook his head, all but imperceptibly even without a spacesuit. "If it had been remote-controllable," he said softly, "maybe my dad could have been saved, or at least we might have found out what happened to him."

Yevgeny turned off the buggy's power and everything went dark save for the brilliant canopy of stars over the black sky. He switched on the lamp attached to his helmet.

"No, leave it dark for a little while," said Arthur, staring up at the heavens. "I want to look at the stars."

Yevgeny turned off the light. "You have Russian soul."

Arthur scanned the sky in the eerie silence broken only by the soft hiss of the radio and the sound of his own breathing. "Beautiful," he said after a minute or so when his eyes had dark-adapted. "I've never seen so many stars."

"They not look real," said Yevgeny. "Stars should—what is word?—twinkle."

"Without an atmosphere," said Arthur, "the stars *do* look artificial. It's like a planetarium. A planetarium sky without the music." He imagined the music: grand, stately, lush, and expansive.

He'd been watching the stars since he was a small boy—since his father had first fired his imagination with the grandeur of the universe. Arthur bit his lip; he was just deferring the inevitable. He lowered his eyes, paused for a moment to gaze at the distant, blinking, red signal light on the lunar lander, then turned and switched on his helmet lamp. "Okay, Zhenya. Let's go."

Yevgeny switched on his lamp and walked toward the long-dormant moon buggy. He gave the vehicle a quick examination, then canted his head downward so the lamp illuminated the ground. "Hah!" he said. "Footprint. Look."

Arthur bounded over, carefully avoiding stepping on the footprints that surely must have been his father's. The single set of tracks led off toward the crater wall. He threw a nod to Yevgeny and the two of them began following the footprints.

Within five minutes, they had followed the trail almost up to the wall of the crater.

"I not see any return tracks," said Yevgeny.

"He must have walked alongside the wall for some reason."

"Bozhe moi!" said Yevgeny in a startled voice as he played the beam of his lamp along the crater wall. "What that?"

The beam moved along the wall, disappeared, and then reappeared.

"An opening in the wall?" said Arthur. "Strange."

Yevgeny loped forward. *"Da!* Strange. Lava tube, maybe."

Arthur joined Yevgeny at the wall and peered into the roughly meter-wide by two-meter-tall void. "I've never heard of lava tubes in crater walls—and certainly not rectangular tubes." He walked tentatively into the opening and examined the walls. "Smooth," he said. "It doesn't look natural. It looks almost as if it were constructed. Vertical walls and a flat floor."

"By previous mission, maybe?"

"We weren't briefed about it." Arthur directed his beam ahead. "And why?" He walked into the cave.

"Wait!" Yevgeny shouted from behind, the shout unnecessary as they communicated by suit radio. "It perhaps dangerous. In fact, definitely dangerous because your . . ."

"I know," said Arthur, slowing down but not stopping. "Because my father must have—"

"I think we go back," said Yevgeny from the cave entrance. "Make report.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Wait for instructions from Commander."

"I'll go just a little farther," said Arthur, straining to see into the void. "Maybe I'll find something to actually report."

"No!" came another voice. Arthur started. It still felt strange that casual talk could travel over radio distances. "No," the voice repeated, Commander Drummond's voice. "We must assume you are in danger. Return to the lander."

"Yes, sir," said Yevgeny, quickly, as if by reflex.

Arthur stopped and turned back the way they'd come. But he made no response to Commander Drummond. Yevgeny took a few steps, then swiveled around and looked at Arthur with a curious expression.

Arthur felt torn between his duty to honor Drummond's order and his duty to his father.

"I'm sorry, Zhenya," he said in Russian after a few seconds. "I've got to see where this tunnel leads." He turned and continued into the depths of the cave. After a few steps, he looked over his shoulder and saw Yevgeny shrug—obvious even through a spacesuit. Then Yevgeny followed Arthur into the cave.

"Davidson. Report!" came the commander's voice. Arthur ignored it. "Davidson. Zhukov. Report!" Drummond insisted.

Yevgeny caught up, tapped Arthur on the shoulder, and the two of them pressed forward.

After twenty meters or so, the cave sloped downward. Arthur looked back and could no longer see the points of starlight through the opening. They walked on in a silence broken only by Commander Drummond's repeated orders. But as they pressed on and more rock stood between them and the lander, Drummond's radio voice crackled, faded, and finally became inaudible.

"You didn't have to come," said Arthur once he realized the commander was well out of radio range.

"But I wanted to, my friend." Yevgeny chuckled. "You are not only one who want adventure."

"Bolshoya spasiba," said Arthur. "I'm really glad you're with me. But we are disobeying a direct order."

"Is Russian system, Generals pretend give orders; we pretend obey them."

After about a fifteen-minute walk, the downward slope leveled out and, after a further five minutes, Yevgeny and Arthur emerged from the passageway into a large circular chamber. They scanned the room, their lamps illuminating swaths of the wall and ceiling. By Arthur's estimation, the chamber was forty meters in diameter. The wall, whitish-gray, stood just under two meters high and was topped by a black hemispherical dome. The wall and dome were both smooth but not shiny. In the middle of the room, Arthur could see a pedestal. It looked to be about a meter and a half high.

Arthur, taking in as much of the scene as his lamp allowed, stood open-mouthed.

"This artificial," said Yevgeny nervously. "Who build it?"

"No one from my country, certainly," Arthur whispered. He wondered why he felt comparatively calm in the face of this discovery. He should be ricocheting off the walls with excitement. *Maybe because the Moon itself is so alien.* He took a step forward. "It looks like an abandoned artifact of an ancient civilization."

"I not think abandoned. Your father came here, but not here now." Yevgeny pressed himself back against the wall. "Maybe they take him," he whispered. "Maybe they still here."

"Come on, Zhenya. That was almost twenty years ago."

Yevgeny gave a quick, self-deprecating laugh. "Sorry. I—what is phrase?—lost it for moment." He took a few steps away from the wall, then stopped and looked back. "Maybe we *should* obey Commander Drummond's orders."

"Yeah, probably," said Arthur, in a distant voice. He walked toward the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

pedestal.

The pedestal, round, had a rectangular, gently sloping top like a lectern. As he leaned over it, Arthur saw symbols on the surface and what seemed to be a large push-button with a legend under it. As Yevgeny came close, Arthur studied the symbols.

"I not see any writing like this before," said Yevgeny.

"Me neither." Arthur jerked back as the significance hit him. "This isn't an Earth writing system. I'm sure of it." He turned his helmet to illuminate Yevgeny's faceplate. "Do you know what this means? This place isn't the work of an earlier, advanced Earth civilization. It can't be."

"Why not possible?"

Arthur paused. "Well, maybe it can be. But it's unlikely. Modern man has only existed for thirty or forty thousand years. I can't believe we wouldn't have unearthed artifacts of an advanced civilization." He paused again. "I'm sure of it." He glanced once more at the symbols. "This *is* alien."

Yevgeny nodded.

Arthur regarded the pedestal with a sense of awe. "This is wonderful," he said. "Even though SETI never found one, I've always believed there were other civilizations in the galaxy." Almost as an act of faith, he placed a hand over the button and held it there. He more sensed than saw Yevgeny tense up beside him. "Objections?" said Arthur.

Yevgeny didn't answer for a moment. Then he shrugged. "*Nyet.* No objection."

Arthur pushed down on the button.

The dome filled with stars.

"Jeez!" Arthur gazed upward. The stars shone bright—but they shone blue. "Maybe," he said, tentatively, "the aliens see white stars as blue."

Yevgeny shook his head. "Is El Greco fallacy."

"What?"

"El Greco was Spanish artist who painted people very thin and tall. Some said that maybe he saw people very thin and tall. But that nonsense. If he look at his own painting, people would look even thinner."

"Maybe the aliens see both white and blue as blue."

Arthur switched off his lamp and took in the blue, starry sky. Yevgeny turned off his lamp as well and the illusion was complete—the night sky viewed through blue-tinted glasses.

"A strange planetarium," said Yevgeny.

"And it makes no sense," said Arthur. "A planetarium on the Moon. It's like a zoo in the jungle, or building a swimming pool under water. What's the point?"

Yevgeny gave a short laugh.

"Wait a moment!" said Arthur. "This isn't right." He scanned the ersatz sky. "I don't recognize this sky."

"You right." said Yevgeny. "Maybe it sky of alien home planet."

"Could be."

"Arthur, look!" Yevgeny pointed at the pedestal. Where before there had only been a single button, a collection of buttons, what looked like a slider, and a display had risen from the surface, all illuminated in various shades of blue and violet.

"A planetarium, complete with a control panel," said Arthur at a whisper. "But what is its *purpose?*" He bent over the panel and tried to comprehend it. But close up, it hurt his eyes. "I bet a lot of this display is radiating in the ultraviolet."

The central display seemed to be a meter of some sort, rich with information; a dark violet vertical bar showed at the far left of the meter and another stood at the far right. A half-height, deep blue bar, apparently a pointer, overlaid the right violet bar. Above each of the two violet bars was a complex, half-centimeter high emblem. Arthur pointed his finger at the one on the left.

"Maybe picture of spaceship." Yevgeny stared at the icosahedron-shaped insignia.

Arthur nodded, then turned his atten-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tion to another section of the panel—a button under which lay a symbol that obviously represented the Earth. On impulse, Arthur pushed the button. Instantly, the blue-green brilliance of the crescent Earth appeared in the sky. But, like the stars, the Earth looked bluer than it should. Arthur smiled with the satisfaction of a control working the way he thought it ought to. He looked back at the stars and bit his lip. "You know," he said after a few seconds, "maybe the sky *is* the sky from the Moon, but as it looks either in the far future or in the distant past."

Yevgeny pointed at the little spaceship emblem at the right side of the meter. He tapped on the half-height bar hugging the limit of the display. "Maybe meter represent time, and this when aliens landed on Moon."

"And the sky is as it appeared then?"

"Da," said Yevgeny. "Is possible."

Under the display was a control; it appeared to be a slider. And a row of buttons were directly under the slider. The rightmost button glowed a dark violet. "Ten buttons," said Arthur. "That suggests the aliens have ten fingers."

"Unless planetarium made for human benefit."

"Hmm." Arthur glanced at the sky and then back to the panel. "I wonder if their preference for blue and violet indicates their vision peaks in the blue rather than in the yellow, like ours. At any rate, it seems they have eyes."

"And their home star possibly more blue—O or B class. Not G class like Sun."

Arthur placed a hand on the slider. "And from the shapes of the controls, they have hands not all that different in size from ours."

"Unless for our benefit."

"In that case," said Arthur, "the colors would have been for our benefit as well; we don't see in UV." He ran a gloved hand softly over the panel. "We're deducing a lot about these aliens of ours."

"Maybe it is test."

"Test?" Arthur smiled. "Fine. Then let's take more of the test." He tried to move the slider slowly to the right, but it didn't move. He pushed it to the left. Still, it didn't move, but the image of the Earth in the sky began to rotate. Arthur pushed on it harder; the Earth rotated faster and exhibited phases. "Interesting. This control uses force, not displacement."

Arthur started as the Sun, unnaturally bluish, appeared in the sky, illuminating the full extent of the planetarium chamber. Arthur, his eyes dark-adapted, squinted against the brilliance.

Arthur pushed the slider yet harder and the Earth's features blurred to a featureless greenish blue. Day alternated with night every few seconds while the Earth slowly cycled through its phases from Full Earth to New Earth and back. The flickering of the days made Arthur dizzy. He released the control. The flickering stopped with the Sun high in the sky. In the brightness of day, Arthur noticed another button with a bright blue circle displayed below it. Arthur pushed it and the Sun went out.

"Good," said Yevgeny. "I almost nauseous."

Arthur glanced at the sky. The stars had changed in orientation, but not in position relative to each other. And the pointer still seemed pinned against the right edge of the meter. "This might take a long time."

Yevgeny pointed to the ten buttons. "Maybe they scale multiplier for time."

"Yeah. I bet they are." The rightmost button was illuminated, so Arthur pushed the leftmost one; it lit while the rightmost button went dark. Again, he pushed the control toward the left. Soon, the stars began to change their positions relative to each other. Arthur gestured to a point in the sky. "That's starting to look like the Big Dipper, isn't it?"

"Da," said Yevgeny. "And that mean sky go forward in time, not backward."

Arthur had his hand pressed against the control when suddenly the stars

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

snapped to an increased brightness. They no longer shone blue, but appeared in their usual colors: mostly white. Arthur, an amateur astronomer, observed that Antares and Betelgeuse were as reddish as usual, and Zubenelgenubi had its expected green tinge.

"This is more like it," he said. "But everything's stopped." The Earth had stopped rotating, and he could clearly make out the continents. And the planets had ceased whizzing through the sky. The light went off on the scale-multiplier push button and the rightmost scale-multiplier button began flashing blue.

Arthur pushed harder on the control, but nothing changed—except a label over the control flashed a bright green. He released the control and the lighted label went dark. Peering at the meter-like display, he saw that the pointer stood at about a third of the way from the left violet line.

Yevgeny pointed a gloved finger at that line. "If other line when alien ship first arrive, maybe this line when they come again."

"Maybe," said Arthur. "I can't seem to advance the stars into the future. The control seems frozen."

Yevgeny laughed. "Maybe now they give harder test."

"But why?" Arthur pushed uselessly at the control. "This sounds really crazy, but what if advancing the stars forward in time advances us too?"

"Agreed," said Yevgeny. "It crazy—and impossible."

"Why? Going backward in time is maybe impossible, but going forward is okay. If we spent some time very near a black hole, then when we backed away, a lot of time could have passed."

Yevgeny nodded. "I agree. Gell-Mann law say if something not absolutely forbidden by physics, then it must happen. So, not impossible—just very, very improbable."

Arthur studied the control panel. "Maybe the flashing button means we can only use a times-one scale factor." He looked over his shoulder at Yevgeny. "This is sort of fun. Like learning a language and actually communicating with an alien culture." He returned his gaze to the panel, stabbed at the button, then pushed the slider control. Nothing happened.

"Maybe you have to hold button down."

Arthur held the button down. It stayed illuminated but the flashing stopped.

"And now maybe, push control."

"Okay," said Arthur. "Here goes." With a finger still holding down the button, he pushed against the slider with his other hand.

He let go the controls and grabbed the panel with both hands for support. For an instant it seemed the planetarium itself was spinning rapidly in multiple directions at once. Then Yevgeny fell against him. Arthur felt a tide of dizziness, disorientation, and nausea—but a second later, it was over.

"What happen?" said Yevgeny, regaining his footing.

Arthur gazed up at the dome. The stars had moved to later in the lunar day and the disk of the Earth showed a different view.

"I think . . ." Yevgeny spoke at a whisper. "I think we go back to moon buggy now."

"Yeah." Arthur glanced back at the entranceway, almost as if checking to make sure it was still there. "Good." He switched on his helmet lamp and then headed for the entrance, consciously moving at a measured pace to avoid giving evidence of his feeling of subsurface panic.

Yevgeny drew level, then when he'd passed in front of Arthur, he turned back. "You okay?"

"Yeah, fine." Arthur picked up his pace to match Yevgeny's. "You don't think we might actually have gone into the future, do you?"

"No." Yevgeny seemed to speak the word without conviction.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Arthur tried to hide his anxiety. "If there's no ship out there," he said, lightly, "we can go back to the planetarium and step ahead. At some point in the future, there should be a Moon colony."

"I hope there *is* ship out there," said Yevgeny, softly, as if to himself.

They walked the rest of the way in silence.

About a quarter of an hour later, Arthur saw the black ahead relieved by a white sprinkle of stars. Rushing to the opening and then through it, he let out a breath as he saw the moon buggy. Then he inhaled sharply and froze; he could see only one buggy.

"It not our buggy," said Yevgeny, going up to examine it. "It old buggy."

Frantically, Arthur scanned the horizon. Seeing the flashing red beacon of the lander off in the distance, he felt relief and also an inexplicable sense of disappointment. "Well, the lander's still there," he said. "I wonder why they commanded the buggy to return."

"Where the goddamned hell have you guys been?" came Commander Drummond's voice shouted over the radio link.

Arthur stiffened.

"Exploring the cave, sir," said Yevgeny.

"What? For eighteen damned hours?"

Arthur and Yevgeny stared at each other. The nondazed part of Arthur's mind speculated that the alien ship's planet probably had a day of seventeen or eighteen hours.

"Zhukov, Davidson. Do you read me?" said Drummond after about ten seconds of silence.

"Yeah," said Arthur absently, his mind occupied with the planetarium.

"Why didn't you obey my orders?" Commander Drummond barked.

"What orders, sir?" said Yevgeny.

"We thought you were dead," Drummond went on. "We brought back the buggy to see if you were inside. Goddamn it. We were going crazy here."

"Sorry, sir," said Yevgeny, showing by his smile that he wasn't in the least sorry.

"Sorry!" Drummond's sigh sounded loudly in Arthur's helmet. "How's your oxygen?"

"Fine, sir," said Yevgeny.

"And you, Davidson?"

Arthur glanced at the suit dials. "About twelve hours remaining."

"That's impossible!"

"Sorry," said Arthur.

Arthur heard another sigh. "I don't know what's going on," said Drummond, "but stay put. I'll send the buggy to you at full speed."

"No hurry," said Yevgeny. "We happy to wait for taxi."

"There is an extreme hurry," said Drummond in an angry voice. "The New Arabia mission will land near you in four hours. And their mission may be armed."

"Armed?" The word sounded alien to Arthur; the Moon should be free of that kind of idiocy. It felt like sacrilege. *I don't believe it.*

"Mission Control was nice enough to tell me that a few hours ago." Drummond's voice oozed with sarcasm. "We've been ordered to return to the orbiter while Mission Control explores our options."

"What options?" said Arthur.

"You don't have a need to know." Drummond paused. "They might be monitoring our frequencies. So stay put and stay quiet. I've got work to do. Drummond, out."

Arthur fumed. He could well guess the options. There was a control panel on the orbiter that only Drummond had access to. Arthur didn't think anything of it then, but now he was sure it was a weapon firing system. *Idiocy. "Defending the freedom of the Moon." I can hear it now.*

Arthur looked back toward the cave entrance. "It looks very inviting." He spoke softly, as if by doing so, his conversation with Yevgeny could be private.

"I thought you had faith in future," said Yevgeny equally softly and in Russ-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ian.

"Da"—Arthur switched to Russian as well—"but not the immediate future." He made a snap decision. "I'm going back."

"I not surprised." Yevgeny nodded. "If I not have wife and child I might—"

"What's going on?" Commander Drummond's voice thundered in Arthur's helmet. "And speak English, damn it."

"I'm going back," said Arthur, "into the cave to . . . to do a little more exploring."

"No. I order you to stay where you are."

"Sorry."

"What?"

"I have to go."

"Zhukov," Drummond bellowed, "stop him. That's an order."

"Yes, sir," said Zhukov while at the same time making go away motions with his hand. "I stop him."

Arthur smiled, waved farewell, and started for the cave. As he walked, he heard sounds of a struggle punctuated by Yevgeny's commentary. Again, Arthur smiled; he seemed to be acquitting himself rather well considering that Yevgeny was taller and heavier. "Take your hands off me," said Arthur, helpfully, as he passed into the cave. A few seconds later, he heard Yevgeny say, "He got away, Commander. You want me go after him?" There was a few second pause before Drummond said in a resigned voice, "No. I can't afford to lose you both. Stay where you are."

Just as Arthur got to the limit of the radio reception, he heard Yevgeny whisper, "Arthur, my friend. Good luck."

"Good-bye, Zhenya."

As he ventured deeper along the passage, he began to entertain second thoughts; had he just effectively committed suicide—on a whim? He paused and thought about going back. He shrugged, shook his head, and continued on. Yes, he'd taken the decision on impulse, but he'd hold to it because of stubbornness. His mother had often told him he'd inherited that trait from his father.

Darkness greeted him as he reentered the chamber. The beam of his helmet lamp only served to emphasize the lack of light—and his loneliness. "Probably an inactivity timer," he said aloud to break the silence. He padded to the pedestal, pushed the button and, as bluish stars filled the sky, switched off his lamp.

He looked down at the pedestal panel display. "And an auto reset," he said, seeing that the display showed the same readings as when he'd first seen it. He pressed the leftmost button and pushed the slider leftward until the stars turned from blue to white and all motion stopped. He stared hard at the sky but couldn't tell if it showed the eighteen-hour advance of time since his first encounter.

Bracing himself against the pedestal for the expected dizziness, he pressed and held down the rightmost button, then pushed the slider.

It wasn't as bad this time, probably because he'd expected it. Arthur looked at the sky. It had changed and no doubt another eighteen hours or so had gone by. He felt very isolated; the lander had probably launched by now, leaving him the only man on the Moon. Then he remembered; the New Arabia mission should have already landed. He thought briefly about going out and finding it. But, relatively speaking, the Moon was a big place. Without at least a moon buggy, a working buggy, the chances of locating the mission was minuscule. Arthur shook his head. He knew he was temporizing—and anyway, if he did locate the mission, he'd probably be arrested on the spot. The space-faring nations weren't exactly the best of friends at the moment.

Arthur gritted his teeth, pressed and held the leftmost button, then closed his eyes and pushed the slider.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The dizziness seemed no worse than before, and had about the same duration. He'd expected something much more dramatic. Opening his eyes, he clutched the pedestal in reaction to another kind of dizziness—vertigo. As if in a hall of mirrors, Arthur saw multiple, superimposed copies of the chamber. At the center of each, he could see a spacesuited figure. The figures, clearly astronauts, grabbed, clutched, or staggered back from one of the central pedestals that vanished to infinity, like telephone poles along a Texas highway.

Then a doorway appeared in the dome—or domes—on the opposite side from the original entrance. Arthur noticed that the spacesuit technology seemed more advanced the farther away he looked—going from his clunky-looking outfit to sleek, almost form-fitting clothing with all but invisible helmets.

An idea was forming. Arthur examined the panel display; the pointer hugged the left vertical line. Yes, the astronauts must all be explorers who, like himself, had discovered the planetarium and had used it to travel to the same point in the future. But a part of his mind questioned his sanity; Zhenya had maintained that this was impossible—and he was right.

Feeling detached, like a performer in a pageant, he turned his gaze to the chambers.

The astronaut who seemed to be the farthest away started for the doorway. The other astronauts followed in a line. Arthur joined the procession and walked toward the entrance. Apparently, last in, first out.

When Arthur got to the entrance, he saw that it was night on the Moon, but the crater was brightly lit. There were people waving, clearly a welcoming committee—and they weren't wearing spacesuits. Arthur thought he could make out a hint of a clear dome over the crater.

Ahead, an astronaut took off his helmet. Arthur watched him for a few moments. The man didn't collapse or anything, so Arthur felt safe in removing his own headgear. As he lifted off his helmet, he felt a breeze and inhaled a clean smell, very welcome after the recirculated intimacy of his spacesuit. And he heard sounds of the world again, voices of happy, laughing people and not just the tinny voices from his transceiver or the sounds of his own breathing.

Just then, the talking and laughing stopped. People stopped and gazed up to where a spacecraft, an enormous icosahedron-shaped vessel, had suddenly appeared. Although it was night in the crater, but just barely, the ship was high enough to catch the rays of the sun. It looked magnificent: polished metal, angular surfaces with large viewports, blue auroralike plumes from the engines.

Observing the craft coming to a landing outside the domed crater, Arthur felt as if he were watching a sci-fi epic. He could almost hear the music.

"That must be it!" Arthur realized the purpose of the planetarium; it had to be a recruiting booth for explorers—explorers with a talent for languages. *Maybe not a ability for languages so much as a flair for solving puzzles—or an aptitude for solving anything. Or all of the above.*

Then he saw the sun peek above the horizon, sending the terminator across the crater at about the speed a man could run. Night turned abruptly to day. In the Moon's gentle gravity, Arthur felt like jumping and cavorting out of sheer excitement. It looked as if it was going to be a nice day. It would be great if he had someone to share it with.

Arthur heard a sound from behind and spun around. Having thought he was the last in the line, he was surprised to see a figure in an older-style spacesuit. As the figure began to remove his helmet, Arthur sucked in a breath. He let his helmet thud to the ground and rushed forward. The figure appeared startled for an instant, then flung off his helmet and spread his arms. ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE ALTERNATE VIEW Jeffery D. Kooistra

ROBERT HEINLEIN TURNS 100

Had life imitated art to the extent that Robert Heinlein had lived just a slightly larger percentage of the life span of his beloved character Lazarus Long, he would have been celebrating his 100th birthday next month, on 7/7/7 (the "number of the *Best,*" in my opinion). Since life didn't, we're just going to have to have a party without him, and, indeed, a big one is planned.

If you haven't heard about the party yet, then make all haste to your computer and check out the following website, <http://www.heinleincentennial.com>. Granted, the party takes place over the weekend of July 6-8, and this is the June issue, but publishing schedules being what they are, I figure you're probably reading this sometime in April or May, so there's still plenty of time to join in the festivities yourself. I'm certainly planning on being there.

If you attend you can hang out with such luminaries as Dr. Michael Griffin, the current administrator of NASA; X Prize Chairman and Heinlein Prize Winner Dr. Peter Diamandis; Brian Binnie, pilot of SpaceShipOne; authors Spider and Jeanne Robinson; and a bunch of others—the list keeps growing. There will be events, there will be shows, there will be tours—I'm not going to tell you what all of them are, since I'm writing in December and, well, details can change.

I'm also not going to tell you much about Heinlein. I never met the man, and he died before I published anything. He's just always been one of my all time favorites. If you want to know about Heinlein, go get yourself a copy of his *Expanded Universe* (ISBN 0-441-21883-0). Therein you can read Heinlein stories and also read what Heinlein had to say about Heinlein. You can also easily find books written by others about Heinlein, people who knew him and people who didn't, people who know what they're talking about, and people who don't. And then there's the Internet.

What I am going to tell you is my own cute little Heinlein related story, one that I think is unique in the SF world (and if it isn't, one of you will be sure to tell me), but I'll save that for the end.

I credit Heinlein for helping to turn me into an Alternate View sort of author. Some of my earliest memories of adult science fiction involve seeing Heinlein's name on books in my elementary school library. I can still picture those exciting illustrations in the juvenile novels, and summon up the feelings they gave me then. Granted, the juveniles aren't exactly adult, but they did serve to forever link the name of Heinlein with the concept of "stuff I'm going to enjoy reading."

In preparation for writing this column, I felt the need to reread Heinlein's novella "Waldo." I hadn't read it since high school, but I recalled there was some aspect to it that had deeply influenced how I think. The story appeared in *Astounding* back in 1942, and it was clear upon rereading it that Heinlein was going for word count as well as quality when he wrote it, for it is bloated. Still,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

it is immensely entertaining. The relevant plot point for my purposes revolves around Waldo's (he's a high-paid consultant genius) attempts to understand a mysterious phenomenon. It seems that the broadcast power system the world relies upon is breaking down. Power receptors stop working for no apparent reason. However, one man had the power-receiving antenna on his flying car repaired by a backcountry "witch doctor" of sorts. The problem is not that the repaired antenna doesn't work—it works perfectly. But the formerly stiff elements of the antenna now writhe and sway and move around like a hand grasping power from the void.

Heinlein was very well educated in both science and engineering, and understood better than most how scientists think and work, or at least how they are *supposed* to. And in this story he presents his hero with a phenomenon flagrantly unexplainable via known science. Indeed, it looks and acts like magic.

What Heinlein understood was that an ordinary scientist would have written the effect off as a trick, and probably sight unseen. (Judging from the reaction I get whenever I bring up cold fusion or flying saucers, they also get obnoxious and disdainful.) But in this story he has Waldo proceed in a different way. First Waldo validates the reality of the phenomenon, both its existence and its inexplicability within the confines of known science. He then goes ahead methodically investigating the phenomenon even though it requires him to abandon concepts about reality that he knows to the core of his being must be true.

I won't spoil the story for those of you who have never read it. The point, and the value of this story for me, is that Waldo provided for me an early model of how one should approach the unknown, with a skeptical but open mind, not a skeptical and closed one.

* * *

My second published story I owe almost entirely to Heinlein. Prior to writing it, I had been reading the collection *Requiem: New Collected Works by Robert A. Heinlein and Tributes to the Grand Master* edited by Yoji Kondo (ISBN 0-312-85523-0), and had recently reread the actual story "Requiem." That is the story of how D. D. Harriman, the man who sold the Moon in the story "The Man Who Sold the Moon," finally made it to the Moon himself and died there. One night as I was leaving my girlfriend's apartment (Dorothy and I weren't even engaged yet), I walked out into the parking lot and saw this most beautiful crescent moon hanging low on the horizon—a thin line of light, like two horns pointing upward. I was so struck by the view that I felt compelled to pause and drink it in.

A story idea came to me as I entered my car.

Fortunately, the drive out of the apartment complex was mostly into the west, so I got to look at the Moon the entire time. It wasn't a long drive—maybe a third of a mile—but by the time I got out to the main road, I had the entire story plotted in my mind. Then it just remained to go home and write it, and the result was "The Return of the Golden Age" which appeared in the March 1993 issue of *Analog*. In it, I had my protagonists Max and Jimmy (Max was named after the character in *Starman Jones*) take a special grave marker similar to that described in "Requiem" to the Moon as a way of thanking Heinlein for inspiring so many. Never before, nor since, has a story appear so precisely in my mind, nor worked itself out so well when I wrote it down.

But this story became linked with Mr. Heinlein even more closely than I had intended.

I had been very careful to make sure my protagonists landed their ship in the same place on the Moon that Heinlein had his heroes bring Harriman, and this was in the area of Mare Fecunditatis, the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Sea of Fecundity. How shocked and confused was I when the issue bearing my story arrived and I discovered that Mare Fecunditatis had been changed to Mare Imbrium. Why in the hell would anyone make a change like that? This made no sense to me at all. It didn't really make any difference to the enjoyment of the story, but this was just the sort of inconsistency with the original that I disdain.

As it happens, I was in New Orleans that year for the Nebula Awards Banquet, and to pick up the Analytical Laboratory Award for best short story of 1992 for my first published story, "Love, Dad." I met Stan Schmidt for the first time, and one of the first things I asked him was why the names of the seas had been switched in my recent story. Even more confused was I when he answered that "they" (meaning the *Analog* editorial staff) had wondered why it was that *I'd* switched seas from what was in the original story. For some reason, someone had been rooting around in the *Astounding/Analog* cellar and had noted the original incarnation of the story in the pages of *Astounding*, and seen that therein Heinlein had placed the landing in Mare Imbrium. Subsequently, the appropriate changes were made to my manuscript.

But the mystery didn't remain a mystery for long. At least I don't think so. I suppose there could be another explanation for what happened, but I really doubt it.

I was sitting around talking with some other writers, amongst them Poul Anderson and his wife Karen, when I related my curious story of the landing site name change. And then Karen Anderson looked up from what she was doing (which I think was knitting, but it could have been needlepoint), her eyes alight and said words to this effect: "I bet it has something to do with Kay Tarrant."

By way of explanation, Kay Tarrant worked for years with John Campbell as assistant editor of *Astounding* and *Analog*. (Note that in the earliest issue of *Analog* that I have, August 1973, she is listed as assistant editor Kay Tarrant. I've also heard her referred to as "Katie" and "Kate" and "Katherine," and I don't know if her title was assistant editor back in the Golden Age.) Over the years a sort of game developed amongst the writers and Kay. You see, as guardian of the public morality, Kay would edit out or change morally suspect phraseology in stories prior to their seeing print. So of course, *Astounding* and *Analog* authors would go out of their way to include morally suspect double-entendres in their stories, but written in such clever and stealthy ways that Kay Tarrant would miss them. One of the most famous examples of a naughty expression that got by Kay is from a George O. Smith story in which he referred to "the original ball-bearing mousetrap," by which he meant a tomcat.

No doubt Heinlein attempted to slip one by Kay Tarrant by having his spaceship land near the Sea of Fecundity, "fecund" meaning "fruitful in offspring." Or perhaps he didn't and Kay just took it that way. After all, he didn't make up the name—there really is a Mare Fecunditatis on the Moon.

Be that as it may, in subsequent publications, Heinlein's original landing site was restored, for that is how it appears in the Yoji Kondo book and also Heinlein's collection *The Past Through Tomorrow*. Nevertheless, the holy hand of Kay Tarrant reached out from the past and had it's way with my story, changing the name again so that my tale, appearing more than fifty years later, would be consistent with the original *Astounding* incarnation of "Requiem."

I doubt if anything like this has ever happened to any other author. Yet that is how Kay Tarrant, that defender of public morality, that paragon of editorial virtue, that scythe to the base of the weeds in the fertile minds of the Golden Age giants we all revere, did Robert Heinlein and me at the same time. ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Probability Zero

Vectoring

Geoffrey A. Landis

Pay attention. This is information you need to know.

You read science fiction; I expect you've heard speculation about uploading, copying a human brain onto a computer. It's a popular meme in certain techno-geek circles. But the problem is immense! Just how do you copy a brain? A human brain contains a hundred trillion synapses, and replicating a brain in software means you'll have to map them all. Sure, you say, use some kind of nanotechnology, little milli-microscopic robots. But that makes no sense: the inside of a human body is a very messy place for hypothetical nano-robots to operate. It would be like trying to operate fine machinery in a swamp.

Well, there was a biologist. Call her Amanda Quinn. That's not really her name, but she's dead now anyway. Dr. Quinn had the revelation that you don't need to invent nanotechnology; bacteria are little nanotech robots, and they're cheap. They reproduce on their own, they're adapted to live inside the human body, and—here's a neat little trick she figured out how to do with reverse-transcriptase—they can record the synapse pattern right into their DNA, just like writing data to a hard disk. Lots of data storage available on DNA.

Amanda did the trick with a species of meningitis bacteria (specifically a strain of *Neisseria meningitidis*, the classic meningococcus, that happened to be available in her lab, if you care). The Neisseria weren't designed to work together, but she tweaked that, and she rewrote their genome a little to help them pass the blood-brain barrier a little easier. Evolution is good at exploring a wide trade space, but when you know what you want, design is a lot better: she could make bacteria do stuff that they could never do by evolution. After all, birds can't fly 600 miles per hour, but jets do.

She did the work in her home lab, so the university wouldn't grab the patent rights, and started out on rats. The university safety office was always going on about safety protocols; maybe she

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

should have listened. Or talked to a rat scientist. Rats bite, if you're not careful.

The original bacterium had coevolved with humans, which meant that it wasn't very fast or very lethal, but when she was making her changes she turned off a lot of the features that kept its growth rate slow. Now it goes kind of crazy, reproducing way too fast for its host's good. Other than that, the bacteria worked just the way she'd planned; copying every nuance of her synaptic patterns while eating her brain.

She could have been contrite, I guess, contacted the authorities, spent her remaining few months helping search for a cure to the disease she'd invented. She didn't think like that. Instead of a cure, she worked on the revised version, 2.0, a little more contagious.

Oh, and she reversed it. Writing isn't much harder than reading, it turns out; the 2.0 version takes that information written in the DNA, and writes her synapse pattern into other brains.

So, here's the bottom line. Do you sometimes feel like you're someone else? Forget what you were doing a couple of hours of the day? More and more of the day you're not really all there?

You're dying. And your brain is being overwritten.

Too bad the infection is still deadly. Once it finishes writing her into your brain, she'll have six months, maybe a year, before it kills her. (You.) She'll progress a little in her research. She might even get to the cure, using your brain (or what used to be your brain), but probably not.

Her original body is dead by now, but she keeps all her notes on the web. She can access them from anywhere, and by now she's used to switching bodies. I think there's a few hundred of her working on the problem.

And that's good, because right now, she's your only hope. You see, you're infected with both of the strains she made, the 1.0 and 2.0 versions. Right now, about a hundred billion of the little guys are writing her brain pattern into yours, and about a hundred billion or so of the other kind are busy copying down your synapse pattern before they eat it.

Some of her memories are yours now (soon enough all of them will be). You'll discover you know your way around a lab. Do a little work with plasmids, zip some DNA around. The 1.0 bacteria don't propagate very well, but you can engineer them to deliberately infect people. You'll still die—sorry—but if you make your little passengers infectious, you'll wake up in somebody else's brain.

For a while, anyway. Then you'll have to move on.

Well, yes, that means you'll be a parasite. Is that so bad? Intelligence has always been a parasite. But now you can pass along more than just language, cultural values, and religions. Now you can pass along your entire personality.

It's beginning to infect other animals too, I think. The other day I saw a dog pawing at a computer, trying to log into Amanda Quinn's files. And I'm a little worried about the raccoons.

But that doesn't matter to you now. You want to live? It's easy enough. Learn to be infectious.

It's your only hope. ■

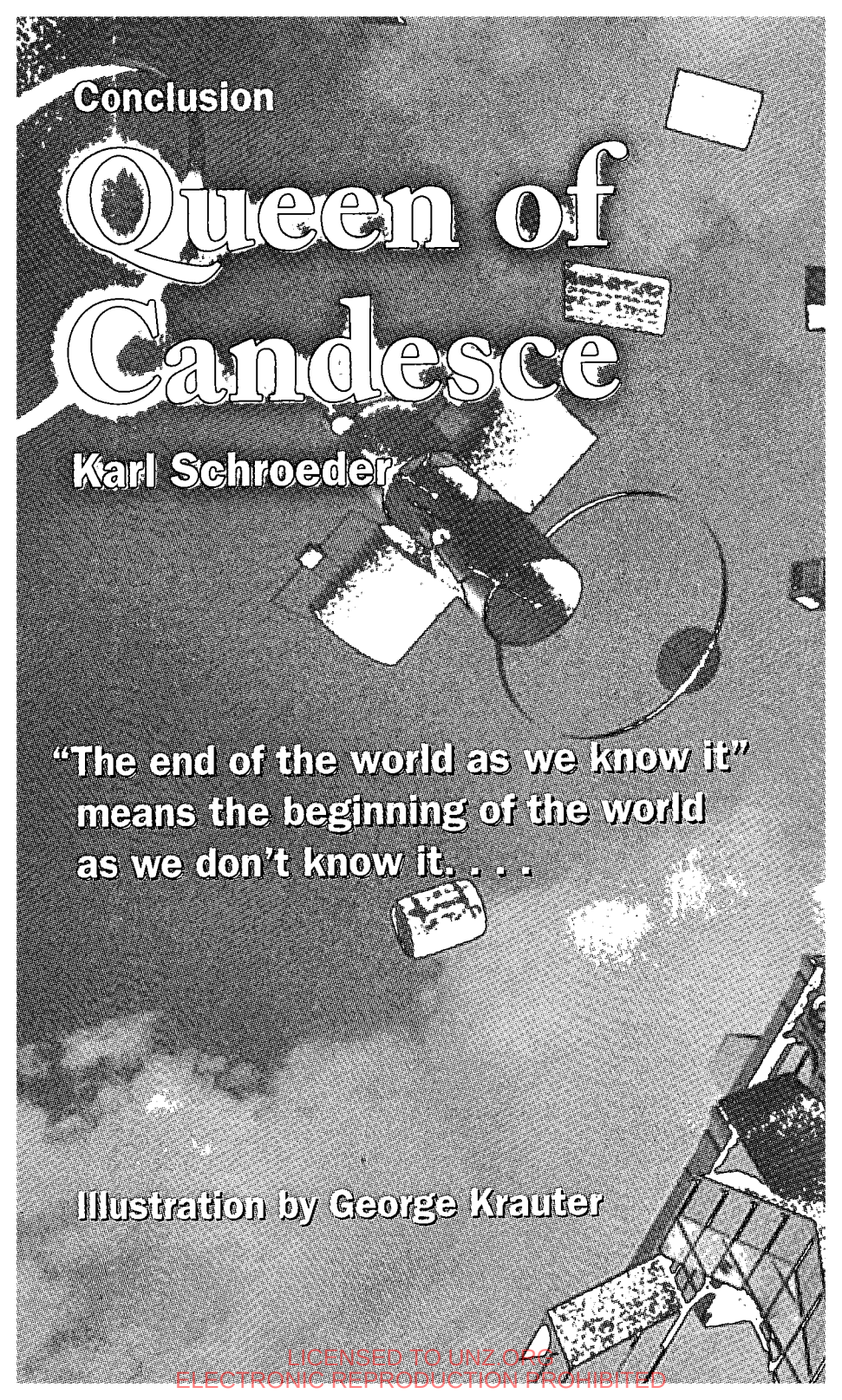
READERS: If you are having problems finding *Analog Science Fiction and Fact* at your favorite retailer, we want to help. First let the store manager know that you want the store to carry *Analog*. Then send us a letter or postcard telling us the full name and address of the store (with street name and number, if possible). Write to us at: *Analog Science Fiction*, Dept. NS, 6 Prowitt St., Norwalk, CT 06855-1220. Thank you!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Conclusion

Queen of Candesce

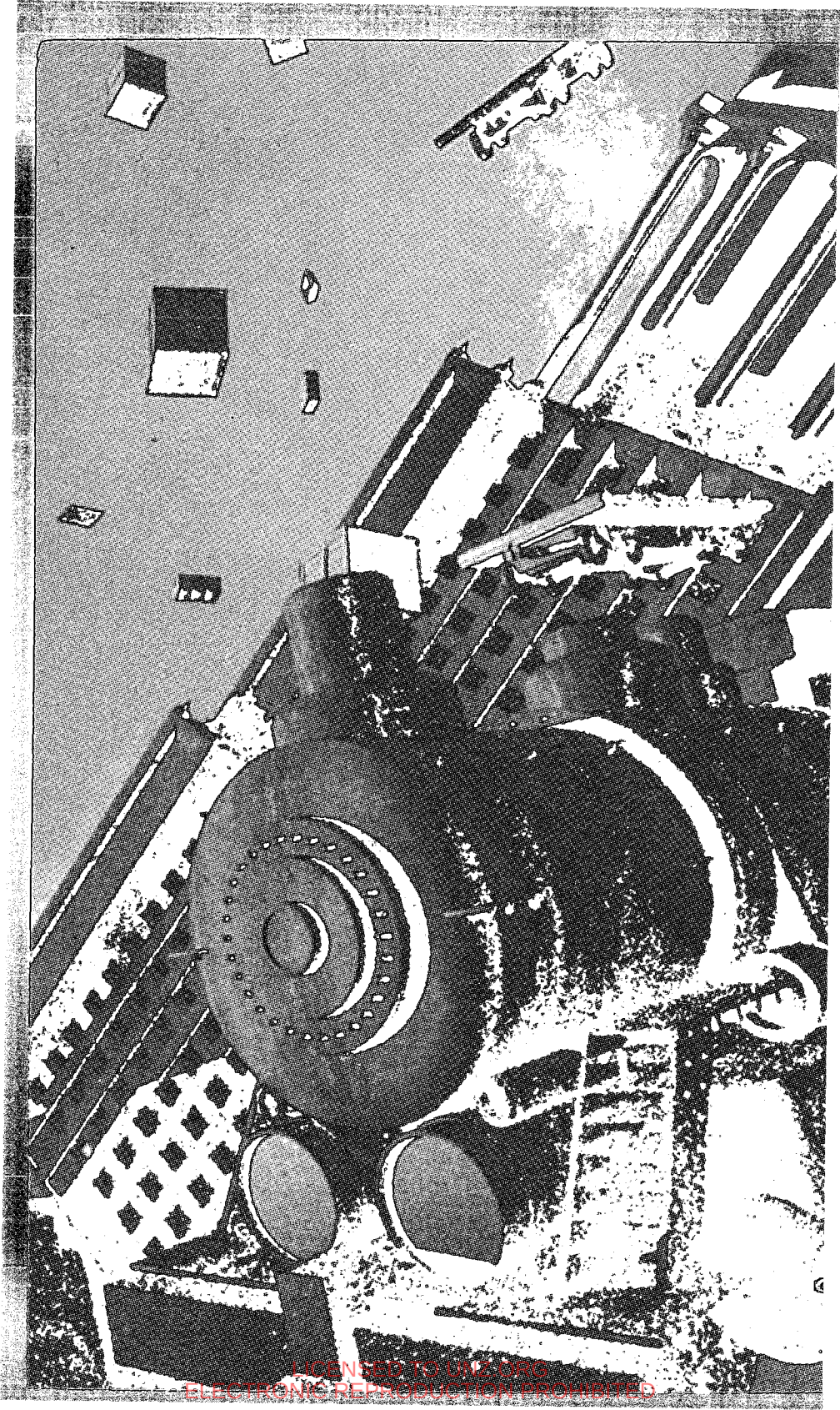
Karl Schroeder



"The end of the world as we know it" means the beginning of the world as we don't know it. . . .

Illustration by George Krauter

LICENSED TO UNZ ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UMZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Story So Far

A woman is falling from the sky. She's taking a long time doing it, so ***Garth Diamandis****, aging playboy and exile on Greater Spyre, takes his time in setting up her rescue.*

Greater Spyre is circular, a vast open-ended cylinder of metal at least twelve miles in diameter. Spyre is thousands of years old and is slowly falling apart. Its inner surface is paved with dirt and trees and dotted with strange, inward-turned pocket nations. Garth's people have always lived here, either in the paranoid miniature kingdoms of the cylinder, or in the rotating cities that hover in the open air around which Spyre revolves. Few of them have ever taken an interest in the world beyond Spyre; yet this woman has drifted in on the weightless air from that very world.

Garth manages to catch her before she tumbles to death on Spyre's inner surface and takes her home to the damp basement he's called home for the past dozen years or so. It is here that ***Venera Fanning*** *awakens a day later.*

Ah, Venera: sociopath princess, pampered courtier, and spy-mistress; casual murderer, recent savior of the world, and wife of ***Admiral Chaison Fanning*** *of Slipstream. Garth, ladies-man that he is, is immediately besotted with her. But he can't puzzle out her strange story, which involves pirates, betrayal, and ruin at the very heart of the world.*

Some of what she says is familiar. Garth knows that Spyre is one tiny object spinning in the immense artificial world known as Virga. Virga is a hollow sphere—a balloon, essentially—several thousand miles in diameter, orbiting on its own somewhere in deep space. The balloon contains air, water, drifting rocks—all the necessities of life, including man-made fusion suns that light small parts of its vast volume. Nations coalesce around these suns, and the greatest sun is Candesce, which lies at the very center of Virga. There is no gravity in Virga, save that which you can make using centrifugal force. Spyre is one of the most ancient of the habitats built to take advantage of Virga's strange environment.

It is also a place where, once you have arrived, you may never leave. Garth tries to convince Venera of this fact, but she refuses to believe him. She comes from Slipstream, a nation of mile-wide wood-and-rope town-wheels and free-floating buildings and farms a thousand miles from Spyre. Born to privilege, used to freedom—and ever sure of herself—she sneaks away from Garth to attempt a grand leap off the edge of Spyre. Before she can reach weightless air and escape, however, she is captured by soldiers of the four-acre nation of Liris. Dragged inside the single cube-shaped stone building that makes up the ancient nation, she is forcibly made into a citizen and called on to serve ***Margit****, Liris's "botanist" or ruler.*

Serving the botanist is educational. Venera learns that the claustrophobic principalities that dot the cylinder's surface are ancient. Some are so old that they still possess treasures taken from Earth when Virga was first made. Liris, for instance, is the only place in the world where cherry trees grow. Liris and its neighbors sell their rarities in the Great Fair of Spyre, and the botanist intends for Venera to work there until the end of her days.

Margit is going to guarantee Venera's loyalty by injecting her with a drug that will cause madness unless regular doses of an antidote are provided. Venera knows that time is running out, but there are things she must know. She visits the Fair to ask

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

about goings-on in the outside world. Almost immediately she learns that her husband, ***Admiral Chaison Fanning****, has been reported killed in a great battle on the far side of the world.*

Overcome with ice-cold grief and outrage, Venera confronts Margit in her bedchamber. The two women fight but Venera gets the upper hand, injecting the botanist with her own diabolical drug and sending her screaming into the night. Then, assembling the stunned citizens of Liris, she declares Margit's most tragic victim to be the nation's new botanist. Then she walks away from Liris, with no plan and no home anymore to escape to. Alone, aimless and hopeless, she returns to the one man in Spyre she can trust: Garth Diamandis.

Venera has been listed as a traitor in her adopted home of Slipstream and cannot return to the court intrigues of her childhood home in Hale. For a while she drifts in a state of numb despair, living like a vagabond with Garth Diamandis in the wilds of Greater Spyre. When she learns there may be a way off of Spyre, though, she's faced with making a choice. Either go home and confront the fact of Chaison Fanning's death; or delay the inevitable. She decides to delay, by telling herself that she needs power to exact revenge on those responsible for Chaison's death. She will stay here in Spyre until she has that power.

Garth knows of a way to get it. Observant as he is, he's seen that she carries an ancient signet ring (taken from the treasure of Anetene in the last book) marked with the symbol of a horse. If the ring is what he thinks it is, vast riches may be theirs for the taking. But it won't be easy: to learn the truth they have to brave the deadly airfall, a region of Greater Spyre where the ground has given way and torrents of wind blast down and out of the world. Garth leads Venera along hidden paths to the gates of a forlorn tower that stands alone in the midst of the airfall. There, her ring turns out to work as a key, letting them in to Buridan Tower, which has not been entered in two hundred years.

Venera takes the identity of ***Amandera Thrace-Guiles****, last heir of Buridan, and rises up the Buridan elevator to Lesser Spyre to claim an inheritance that has been waiting for an heir for centuries. Naturally the great powers of Spyre are skeptical of her claim—none more so than* ***Jacoby Sarto****, spokesman for the feared nation of Sacrus. Sarto does his best to torpedo Venera's claim, an effort that culminates in a confrontation during her confirmation interview. Sacrus, it turns out, is the homeland of Margit. Sarto knows about the key to Candesce and reveals that Sacrus has it.*

During these escapades Venera also has a run-in with a local insurgent group, which is led by a young man she finds attractive: ***Bryce*** *is of noble background but has adopted the Cause, which is to reintroduce a form of emergent democracy to Spyre, and eventually Virga itself. Venera thinks he's doomed to fail, but he emerges as a key ally as events unfold.*

So now she has the wealth and power she craved—even if her hold on it is tenuous. What to do? Venera's not willing to admit the growing sense of affection she feels for Garth, or the equally unfamiliar sense of loyalty she's learning. She decides to leave Spyre. At the same time, Garth is completing his own quest, a search for someone named ***Selene Diamandis****. They part ways, two battle-scarred veterans of long emotional wars, with no expectation that they will ever meet again.*

Free of Spyre at last, Venera feels a huge burden lifted from her shoulders. She watches from a passenger ship as the twelve-mile-diameter open-ended

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

cylinder that is Virga's oldest nation recedes among the clouds. But Spyre is not done with her yet.

Venera's ostensibly on a trade expedition to the principalities of Candesce on behalf of Buridan House. In fact she intends to jump ship at the nearest port and make her way back to her adoptive home of Slipstream. There, she is planning regicide, for she blames the sovereign Pilot of Slipstream for the death of her husband Chaison. Venera's not one to plan small.

Just as she's about to put her plan into action, Venera receives an unsigned letter telling her that her friend Garth Diamandis has been abducted back on Spyre. The evil pocket nation of Sacrus has him, and they will torture and kill him unless she returns to Spyre and does what they say.

Venera pretends to be indifferent to Garth's fate, but in reality she can't leave him. She has to invent an excuse for herself, but in the end returns to Spyre to save him. Sacrus has made her mad; assassinating Slipstream's king will have to wait.

Back in Buridan, Venera enlists the aid of the insurgents led by the dashing if naive Bryce. She also returns to her former home of Liris to gain their aid, and Liris's new Botanist promises to bring in the powerful preservationist faction as well. Venera intends a strike into the very heart of Sacrus territory to rescue Garth. This would be impossible for any party traveling overland, but she intends to go underland—below the skin of Spyre and up through the basement of Sacrus's fortress, the Grey Infirmary.

What follows is a set piece of squad-scale combat as Venera's group infiltrates the building and finds Garth. In the course of this adventure, Venera has another run in with her former employer, Margit of Sacrus, who is now completely mad (Venera's fault, but something she refuses to feel guilty about). Margit has the key to Candesce and is about to kill Garth when Venera intervenes. She escapes Sacrus with both Garth and the key.

Back in safe territory, Venera complicates her life by unexpectedly falling into bed with Bryce. Whether it's just an adrenalin reaction or the sign of something deeper, she has no time to find out because Sacrus has summoned the Spyre Council to announce that Buridan, in the person of Venera Fanning, has started a war.

17

Treble was a musician by day, and a member of Bryce's underground by night. He'd always known that he might be called upon to abandon his façade of serene artistry and fight in the Cause—though like some of the others in the secret organization, he was uneasy with the direction things had taken lately. Bryce was becoming altogether too cozy with the imposing Amandera Thrace-Guiles.

Not that it mattered anymore, as of this minute. Clinging to a knuckle of masonry high on the side of the Lesser Spyre Ministry of Justice, Treble was in an ideal position to watch the city descend into anarchy.

Treble had gained access to the building disguised as a petitioner seeking information about an imprisoned relative. His assignment was to plant some false records in a Ministry file cabinet on the twelfth floor. He evaded the guards adroitly, made his way up the creaking stairs with no difficulty, and had just ensconced himself in the records office when two things happened simultaneously: the staccato sound of gunfire echoed in through the half-open window; and three minor bureaucrats approached the office, talking and laughing loudly.

This was why Treble found himself clutching a rounded chunk of stone that might once have been a gargoyle, and why he was staring in fascination at the streets that lay below and wrapped up

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and around the ring of the town wheel. He hardly knew where to look. Little puffs of smoke were appearing around the Spyre docks directly overhead. The buildings there hovered in midair like child's toys floating in a bathtub and seldom moved; now several were gliding slowly—and ominously—in collision courses. Several ships had cast off. Meanwhile, halfway up the curve of the wheel, some other commotion had sprung up around the Buridan Estate. Barnacled as it was by other buildings, he could never have identified the place had he not been familiar with the layout, but it was clearly the source of that tall pillar of smoke that stood up two hundred feet before bending over and wrapping itself in a fading spiral around and around the inner space of the wheel.

People were running in the avenue below. Ever the conscientious spy, Treble shifted his position so that he straddled the gargoyle. He checked his watch, then pulled out a frayed notebook and a stub pencil. He dabbed the pencil on the tip of his tongue then squinted around.

Item One: At four-fourteen o'clock, the preservationists broke our agreement by attempting to prevent Sacrus from occupying the docks. At least, that was what Treble assumed was happening. The hastily scrawled note from Bryce that had mobilized the resistance told of arguments during the Sacrus raid last night, hasty plans made and discarded in the heat of the moment. Thrace-Guiles wanted to rally the nations of Greater Spyre that had lost people to Sacrus. The preservationists had their own agenda, which involved cowing Sacrus into letting them run a railway line through the middle of the great nation's lands. Sacrus itself was moving and activating its allies. So much was clear; but in the background of this fairly straightforward political situation, a greater upheaval was taking place.

Bryce had said on more than one occasion that Spyre was like the mainspring of a watch wound too tight. A single tap in the right place might cause a vicious uncoiling—a *snap*. Many in Spyre had read about the Pantry War with envy; over centuries a thousand resentments and grudges had built up between the pocket nations, and it was glorious to watch someone else finally try to settle a score. Everyone kept ledgers accounting who had slighted whom and when. Nothing was forgotten and behind their ivy- and moss-softened walls, the monarchs and presidents of nations little bigger than swimming pools spent their lives plotting their revenges.

The well-planned atrocities of the resistance were little trip-hammer blows on the watch's case, each one an attempt to break the mechanism. Tap the watch, shake it, and listen. Tap it again. That had been Bryce's strategy.

Sacrus and Buridan had hit the sweet spot. Shop-fronts were slamming all over the place, like air-clams caught in a beam of sunlight, while gangs of men carrying truncheons and knives seemed to materialize like smoke out of the alleys. It was time for a settling of scores.

Item Two: chaos in the streets. Maybe time to distribute currency?

Treble peered at the line of smoke coiling inside the wheel. *Item Three: Sacrus seems to have had more agents in place in the city than we thought. They appear to be moving against Buridan without council approval. So . . . Item Four: council no longer effective?*

He underlined the last sentence, then thought better and crossed it out. *Obviously* the council was no longer in control.

He leaned over and examined the flagstoned street a hundred feet below. Some of those running figures were recognizable. In fact . . .

Was that Amandera Thrace-Guiles? He shaded his eyes against Candesce's fire and looked again. Yes, he recognized the shock of bleached hair that sur-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mounted her head. She was hurrying along the avenue with one arm raised to shoulder height. Apparently she was aiming a pistol at the man walking ahead of her. Oh, that was definitely her then.

Around her a mob swirled. Treble recognized some of his compatriots; there were others, assorted preservationists, soldiers of minor nations, even one or two council guards. Were they escorting Thrace-Guiles, or protecting someone else Treble hadn't spotted?

Item Five: council meeting ended around four o'clock.

He sighted in the direction Thrace-Guiles's party was taking. They were headed for Buridan Estate. From ground level they probably couldn't tell that the place was besieged. At this rate they might walk right into a crowd of Sacrus soldiers.

Treble could still hear voices in the room behind him. He tapped the file folder in his coat pocket and frowned. Then with a shrug he swung off his masonry perch and through the opened window.

The three bureaucrats stared at him in shock. Treble felt the way he did when he dropped a note in performance; he grinned apologetically, said, "Here, file this," and tossed his now-redundant folder to one of the men. Then he ran out the door and made for the stairs.

Garth Diamandis staggered and reached out to steady himself against the wall of a building. He had to keep up; Venera Fanning was striding in great steps along the avenue, her pistol held unwaveringly to Jacoby Sarto's head. But Garth was confused; people were running and shouting while overhead even lines of smoke divided the sky. This was Lesser Spyre, he was sure of that. The granite voice of his interrogator still echoed in Garth's mind, though, and his arms and legs bellowed pain from the many burns and cuts that ribbed them.

He had insisted on coming today and now he regretted it. Once upon a time he'd been a young man and able to bounce back from anything. Not so anymore. The gravity here weighed heavily on him and for the first time he wished he was back on Greater Spyre where he could still climb trees like a boy. Alone all those years, he had reached an accommodation with himself and his past; there'd been days when he enjoyed himself as if he really were a youth again. And then the woman who now stalked down the center of the avenue ahead of him had appeared, like a burning cross in the sky, and proceeded to turn his solitary life upside down.

He'd thought about abandoning Venera dozens of times. She was self-reliance personified, after all. She wouldn't miss him. Once or twice he had gotten as far as stepping out the door of the Buridan estate. Looking down those half-familiar, secretive streets, he had realized that he had nowhere to go—nowhere, that is, unless he could find Selene, the daughter of the woman whose love had caused Garth's exile.

Logic told him that now was the time. Venera was bound to lose this foolish war she'd started with Sacrus. The prudent course for Garth would be to run and hide, lick his wounds in secret and then . . .

Ah. It was this *and then* that was the problem. He had found Selene, and she had turned him over to Sacrus. She was theirs—a recruit, like the ones Moss claimed had left many of Spyre's sovereign lands. Sacrus had promised Selene something, had lied to her; they must have. But Garth was too old to fight them and too old to think of all the clever and true words that might win his daughter's heart.

Selene, his kin, had betrayed him. And Venera Fanning, who owed him nothing, had risked her life to save his.

He pushed himself off from the wall and struggled to catch up to her.

A man ran down the broad steps of the Justice ministry. He waved his arms

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

over his head. "Don't go that way! Not safe!"

Venera paused and glanced at him. "You're one of Bryce's."

"That I am, Miss Thrace-Guiles." Garth half smiled at the man's bravado; these democrats refused to address people by their titles. Venera didn't seem to notice, and they had a hurried conversation that Garth couldn't hear.

"There you are." He turned to find the preservationist, Thinblood, sauntering up behind him. He grinned at Garth. "You ran off like a startled hare when she came out of the council chamber."

Garth grunted. Thinblood seemed to have decided he was an old man who needed coddling. It was annoying. He had to admit to himself that it was a relief to have him here, though. The rest of this motley party consisted mostly of Venera's other freed prisoners and they made for bad company, for much the same reasons as Garth supposed he did. They all looked apprehensive and tired. It didn't help that their presence at council didn't seem to have made a dent in Sacrus's support.

Garth and Thinblood had been talking under an awning across the street when Venera Fanning appeared at the official's entrance to the council chamber. She backed out slowly, her posture strange. As she emerged further it became clear that she was holding a gun and aiming it at someone. That someone had turned out to be Jacoby Sarto.

Before he knew it Garth was by her side. "What are you doing?" he heard himself shouting. She'd merely grimaced and kept backing up.

"Things didn't go our way," she'd said. Past Sarto, the council guards were lining up with their rifles aimed at her. At the same time, the commoners' doors around the long curve of the building were thrown open. A hoard of people spilled out, some of them fighting openly. Venera's supporters ran to her side as Bryce's agents appeared from nowhere to act as crowd control. And then a gasp went up from the watching crowd as Principe Guinevera and Pamela Anseratte pushed the council guards aside and came to stand at Venera's side.

"The lines have been drawn," Anseratte said to the council guards. "Sacrus is not on the council's side. Stand down."

Reluctantly, the guards lowered their rifles.

Garth leaned close to Venera. "Did he tell them your . . . secret?" But she shook her head.

Maybe it was having Thinblood's reassuring hand on his shoulder, but as Venera argued now with Bryce's spy, the fog of fatigue and pain lifted enough for Garth to begin to wonder about that. Jacoby Sarto had *not* told the council who Venera really was? That made no sense. Right now Amandera Thrace-Guiles was the darling of the old countries. She was the resurrected victim of Sacrus's historical arrogance; she was a champion. If Sarto wanted to deflate Sacrus's opposition all he had to do was reveal that she was a fake.

"Why did she do it?" he wondered aloud. Thinblood laughed.

"You're trying to second-guess our Amandera?" He shook his head. "She's got too much fire in her blood, that's clear enough. Obviously, she saw a chance to take Sarto and she went with it."

Garth shook his head. "The woman I know wouldn't see Sarto as a prize to be taken. She'd think him a burden and be happy to be rid of him. And if he's a prisoner why doesn't he seem more concerned?" Sarto was standing with his arms crossed, waiting patiently for Venera to finish her conversation. He seemed more to be *with* her than taken *by* her. Garth seemed to be the only one who had noticed this.

"Attention!" Venera raised her pistol and for a moment he thought she was about to fire off a round. She already had the attention of everyone in sight, though, and seemed to realize it. "Buridan is under siege!" she cried. "Our an-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

cient house is surrounded by Sacrus's people. We can't go back there."

Garth hurried over. "What are we going to do? They've moved faster than we anticipated."

She nodded grimly. "Apparently, their ground forces are moving to surround the elevator cables—the ones they can get to, that is."

"Most of our allies are on Greater Spyre," he said. If Sacrus isolated them up here in the city, they would have to rely on the preservationists, and a few clearheaded leaders such as Moss, to organize the forces down there.

For a moment that thought filled Garth with hope. If Venera was sidelined at this stage, she might be able to avoid being drawn into the heart of the coming conflagration. A checkmated Buridan might survive with honor, no matter who won.

Clearly Venera had no intention of going down that road. "We need to get down there," she was saying. "Sacrus doesn't control all the elevators. Pamela, your country's line, where is it?"

Anseratte shook her head. "It's two wheels away from here. We might make it, but if Sacrus already has men in the streets they've probably taken the axis cable cars as well."

Guinevera shook his head as well. "Our line comes down about a mile from Carrangate. They're an old ally of Sacrus. They could use us for target practice on our way down."

"What about Liris?" It was one of Moss's men, standing alertly with a proud look in his eye. "Lady, we are the only nation in Spyre that has recently fought a war. There may not be many of us, but . . ."

She turned a dazzling smile on the man. "Thank you. Yes—but your elevator is above the Fair, isn't it?"

"And the Fair, m'lady, is six blocks up the wheel, that way." He pointed off to the left.

"This way!" Venera gestured for Sarto to precede her, then stalked toward the distant pile of buttresses and roofs that was the Fair.

Garth followed, but as the fog of exhaustion and pain slowly lifted from him he found himself considering their chances. It was folly for Venera to involve herself in this war. Sidelined, she might be safe.

Sacrus had known what to reveal about her to draw her fangs, but they had chosen not to reveal it. The only person on this side of the conflict who knew was Garth himself. If word got out, Venera would naturally assume that it was Sacrus's doing. It would be so simple . . .

Troubled but determined to follow this thought to its conclusion, Garth put an extra effort into his footsteps and kept up with Venera as she made for the Fair.

Liris perched on the very lip of the abyss. At sunoff the building's roof was soaked with light, all golds and purple and rose. The sky that opened beyond the battlement was open to all sides; Venera could almost imagine that she was back in the provinces of Meridian where the town wheels were small and manageable and you could fly through the free air whenever you chose. She leaned out, the better to lose herself in the radiance.

Tents had been set up on the rooftop behind her, and Moss was holding court to a wild variety of Spyre dignitaries. They came in all shapes and sizes, masked and unmasked, lords and ladies and diplomats and generalissimos. United by their fear of Sacrus and its allies, they were hastily assembling a battle plan while their tiny armies traveled here from across Greater Spyre. Venera had looked for those armies earlier—but who could spot a dozen men here or there making their way between the mazelike walls of the estates?

It would be an eerie journey, she knew. Garth had shown her the overgrown gates to estates whose windows

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

were slathered with black paint, whose occupants had not been seen in generations. Smoke drifted from their chimneys; someone was home. The soldiers of her alliance might stop at one or two of those gateways and shout and rattle the iron, hoping to find allies within. But there would be no answer, unless it be a rifle shot from behind a wall.

For the first time in days, Venera found herself idle. She was too tired to look for something to do, and so as she gazed out at the endless skies that familiar deep melancholy stole over her. This time, she let it happen.

She wanted Chaison back. It was time to admit it. There were many moments every day when Venera longed to turn to him and grin and say, "Look what I did!" or "Have you ever seen anything like it?" She'd had such a moment only an hour ago, as the first of the Dali horses were led into their new paddock in the far corner of Liris's lot. The spindly steeds had been trained to be ridden, and she had mounted up herself and trotted one in a circle. Oh, she'd wanted to catch someone's eye at that moment! But she was Amandera Thrace-Guiles now. There was no one to appeal to, not even Garth, who was making himself scarce since their arrival.

She heard a footstep behind her. Bryce leaned on the stones and casually reached out to take her hand. She almost snatched it back, but his touch awoke something in her. This was not the man she wanted, but there was some value in him wanting her. She smiled at him.

"All the pawns and knights are in play," he said. His thumb rubbed the back of her hand. "It's our opponent's move. What would you like to do while we wait?"

Venera's pulse quickened. His strong fingers were kneading her hand now, almost painfully.

"Uh . . ." she said, then before she could talk herself out of it, "They've given me an actual room this time."

"Well." He smiled ironically. "That's an honor. Let's go try it out."

He walked toward the stairs. Venera hesitated, turning to look out at the dimming sky. No: the pang was still there, and no amount of time with Bryce was going to make it go away. But what was she to do?

Venera followed him down the stairs, her excitement mounting. Several people hailed her, but she simply waved and hurried past. "This way," she said, grabbing Bryce's arm as he made to descend the main stairs. She dragged him through a doorway hidden behind a faded tapestry. This led to a narrow and dusty little corridor with several doors leading off of it. Hers was at the end.

She barely had time to open the door before his arms were around her waist. He kissed her with passionate force and together they staggered back to the bed under its little pebbled-glass window.

"Shut the door!" she gasped, and as he went to comply she undid her blouse. As he knelt on the bed she guided his hand under the silk. They kept their mouths locked together as they undressed one another, then she took his cock in her hands and didn't let go as they sank back onto the cushions.

Later as they sprawled across the demolished bed, he turned to her and said, "Are we partners?"

Venera blinked at him for a moment. Her mind had been entirely elsewhere—or more exactly, nowhere. "What?"

He shrugged onto his side and his hand casually fell on her hip. "Am I your employee? Or are we pursuing parallel interests?"

"Oh. Well, that's your decision, isn't it?"

"Hmm." He smiled, but she could tell he wasn't satisfied with that reply. "My people have been acting as your spies for the past few weeks. They're not happy about it. Truth to tell, Amandera, *I'm* not happy about it."

"Aaahhh . . ." She stretched and leaned back. "So the past hour was your

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

way of softening me up for this conversation?"

"Well, no, but if there's going to be a good strategic moment to raise the issue, this has got to be it." She laughed at his audacity. He was no longer smiling, though.

"You'd be mistaken if you thought I was picking sides in this war," he said. "I don't give a damn whether it's Sacrus or your faction that wins. It's still titled nobles, and it'll make no difference to the common people."

Now she sat up. "You want your printing press."

"I *have* my printing press. I forged your signature on some orders and it was delivered yesterday. Those of my people who aren't in the field right now are running it. Turning out bills by the thousands."

She examined his face in the candlelight. "So . . . how many of your people really *are* in the field?"

"A half dozen."

"You told me they were all out!" She glared at him as a knife of pain shot up her jaw. "A half dozen? Is this why we had no warning that the estate was being attacked? Because you were keeping a handful of people where they'd be visible to me?—So I'd think they were all out?"

"That's about the size of it, yes."

She punched him in the chest. "You lost me my estate! My house! What else have you given to Sacrus?"

"Sacrus is not my affair," he said. Bryce was deadly earnest now. Clearly she had misjudged him. "Restoring emergent democracy in Virga is my only interest," he said. "But I don't want you to die in this war, and I'm sorry about your house, if it's any consolation. But what choice did I have? If everything descends into chaos, when am I going to get my ink? My paper? When were you going to do what I needed you to do? Look me in the eye and tell me it was a priority for you."

Venera groaned. "Oh, Bryce. This is the worst possible time . . ."

"—The only time I have!"

"All right, all right, I see your point." She glowered at the plaster ceiling. "What if . . . what if I send some of my people in to run the press? We don't need trained insurgents to do that. All I want is to get your people out in the field! I'll give you as much ink and paper as you want."

He flopped onto his back. "I'll think about that."

There was a brief silence.

"You could have asked," she said.

"I did!"

Venera was trying to think of some way to reply to that when there was a loud bang and she found herself inside a storm of glass, shouting in surprise and trying to jump out of the way, banging her chin while shards like claws scrawled up her ribs and along her thigh.

Scratched and stunned, she sat up to find herself on the floor. Bryce was kneeling next to her. The candle had gone out, and she sensed rather than saw the carpet of broken glass between her and her boots. The little window gaped, the leading bent and twisted to let in a puff of cold night air. "What was . . ." Now she heard gunfire.

"Oh shit." Bryce stood up and reached down to draw her to her feet. "We've got to get out there.

"Sacrus has arrived."

18

There was still a splinter in the ball of her foot, but Venera had no time to find it and dig it out. She and Bryce raced up the stairs to the roof as shouts and thundering feet began to sound on the steps below.

They reached the roof, and Bryce immediately ran off somewhere to the right. "I need to get to the semaphore!" he shouted before disappearing into the gloom. All the lanterns had been put out, Venera realized; she could just see the silhouettes of the tents where her

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

people had been meeting. The black cut-out shapes of men roved to and fro, and she made out the gleam of a rifle barrel here and there. It was strangely quiet, though.

She found the flap to the main tent more by instinct than anything else, and stepped in. Lanterns were still lit here, and Thinblood, Pamela Anseratte, Principe Guinevera, Moss, and the other leaders were all standing around a map table. They all looked over as she entered.

"Ah, there you are," said Guinevera in a strangely jovial tone. "We think we know what they're up to."

She moved over to the table to look at the map. Little counters representing Sacrus's forces were scattered around the unrolled rectangle of Greater Spyre. A big handful of tokens was clustered at the very edge of the sheet, where Liris had its land.

"It's an insane amount of men," said Thinblood. He appeared strangely nervous. "We think over a thousand. Never seen anything like it in Spyre."

Guinevera snorted. "Obviously they hope to capture our entire command all at once and end the war before it begins. And it looks like they stand a good chance of succeeding. What do you think, Venera?"

"Well, I—" She froze.

They were all staring at her. All silent.

Guinevera reached into his brocaded coat and drew out a sheet of paper. With shocking violence he slammed it down on the table in front of her. Venera found herself looking at a poor likeness of herself—with her former hairstyle—on a poster that said, *Wanted for Extradition to Gehellen, VENERA FANNING.*

"So it's true," said Guinevera. His voice was husky with anger, and his hand, still flattening the poster, was shaking.

She chewed her lip and tried to stare him down. "This is hardly the time—"

"This *is* the time!" he bellowed. *"You have started a war!"*

"Sacrus started it," she said. "They started it when they—"

But he'd struck her full across the face, and she spun to the floor.

She tasted blood in her mouth. Where was Bryce? Why wasn't Moss rushing to her defense?

Why wasn't Chaison here?

Guinevera reared over her, his dense mass making her flinch back. "Don't try to blame others for what you've done! You brought this catastrophe on us, imposter! I say we hang her over the battlement and let Sacrus use her for target practice." He reached down to take her arm as Venera scrambled to get her feet under her.

Light knifed through the tent's entrance flap and then miraculously the whole tent lifted up as though tugged off the roof by a giant. The giant's cough was still echoing in Venera's ears as the tent sailed into the permanent maelstrom at the edge of the world, and was snatched away like a torn kerchief.

Another bright explosion, and everyone ducked. Then everyone was running and shouting at once and soldiers were popping up to fire their blunderbusses, then squatting to refill them as trails of smoke and fire corkscrewed overhead. Venera's ears were still ringing, everything strangely aloof as she stood up and watched the big map on the table lift in the sudden breeze and slide horizontally into the night.

Who had it been? she wondered dimly. Had Moss turned on her? Or had Odess said something injudicious? Probably some soldier or servant of Liris had spoken out of turn . . . But then, maybe Jacoby Sarto had become bored of his confinement and decided to liven things up a bit.

Venera was half aware that the squat cube of Liris was surrounded on three sides by an arcing constellation of torches. The red light served to illuminate the grim faces of the soldiers rushing past her. She raised her hand to stop one of them, then thought better of it. What if

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Guinevera had remembered to order her arrest?—Or death? As she thought about her new situation, Venera began to be afraid.

Maybe she should go inside. Liris had stout walls, and she still had friends there—she was almost sure of that. She could, what—go chat with Jacoby Sarto in his cell?

And where was Bryce? Semaphore, that was it; he'd gone to send a semaphore. She forced herself to think: the semaphore station was over there . . . Where a big gap now yawned in the side of the battlement. Some soldiers were laying planks across it.

"Oh no." *No no no.*

Deep inside Venera a quiet snide voice that had always been there was saying, 'Of course, of course. They all abandon you in the end.' She shouldn't be surprised at this turn of events; she had even planned for it, in the days following her confirmation. It shouldn't come as a shock to her. So it seemed strange to watch herself, as if from outside, as she hunkered down next to the elevator mechanism at the center of the roof, and wrapped her arms around herself and cried.

I don't do this. She wiped at her face. *I don't.*

Maybe she did, though; she couldn't clearly remember those minutes in Candesce after she had killed Aubri Mahallan and she had been alone. Hayden Griffin had pulled Mahallan's body out of sight, leaving a few bright drops of blood to twirl in the weightless air. Griffin was her only way out of Candesce, and Venera had just killed his lover. It hardly mattered that she'd done it to save the world from Mahallan and her allies. No one would ever know, and she was certain she would die there; she had only to wait for Candesce to open its fusion eyes and bring morning to the world.

Griffin had asked her to come with him. He had said he wouldn't kill her; Venera hadn't believed him. It was too big a risk. In the end she had snuck after him and ridden out of Candesce on the cargo net he was towing. Now the thought of running to the stairs and throwing herself on the mercy of her former compatriots filled her with a similar dread. Better to make herself very small here and risk being found by Guinevera or his men than to find out that even Liris now rejected her.

"There they are!" someone pointed excitedly. Staccato runs of gunfire sounded in the distance—they were oddly distant, in fact. If Venera had cared about anything at that moment she might have stood up to look.

"We're gonna outflank them!"

Something blew up on the outskirts of Liris's territory. The orange mushroom lit the whole world for a moment, a flicker of estates and ornamental ponds overhead. Her ground forces must have made it here just after Sacrus's.

Well. Not *her* forces, she thought bitterly. *Not anymore.*

"There she is!" Venera jerked and tried to back up, but she was already pressed against the elevator platform. A squat silhouette reared up in front of her and something whipped toward her.

She cringed. Nothing happened; after a moment she looked up.

An open hand hovered a few inches above her. A distant flicker of red lit the extended hand and behind it, the toadish features of Samson Odess. His broad face wore an expression of concern. "Venera, are you hurt?"

"N-no . . ." Suspiciously, she reached to take his hand. He drew her to her feet and draped an arm across her shoulder.

"Quickly now," he said as he drew her toward the stairs. "While everyone's busy."

"What—" She was having trouble finding words. "What are you doing?"

He stopped, reared back, and stared at her. "I'm taking you home."

"Home? Whose home?"

"Yours, you silly woman. Liris."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"But why are you helping me?"

Now he looked annoyed. "You never ceased to be a citizen of Liris, Venera. And technically, I never stopped being your boss. You're still my responsibility, you know. Come on."

She paused at the top of the steps and looked around. The soldiers who had crowded the roof all seemed to be leaping off one side, in momentary silhouetted flashes showing an arm brandishing a blunderbuss, another waving a sword. There was fighting down in the bramble-choked lot that surrounded Liris. Farther out, she glimpsed squads of men running back and forth, some piling up debris to form barricades, others raising archaic weapons.

"Venera! Get off the roof!" She blinked and turned to follow Odess.

They descended several levels and Venera found herself entering, of all places, the apartments of the former botanist. The furniture and art that had borne the stamp of Margit of Sacrus was gone, and there were still burn marks on the walls and ceiling. Someone had moved in new couches and chairs, and one particularly charred wall was covered with a crepuscular tapestry depicting cherry trees shooting beams of light all over an idealized tableau of dryads and fairies.

Venera sat down under a dryad and looked around. Eilen was there, and the rest of the diplomatic corps. "Bring a blanket," said Odess, "and a stiff drink. She's in shock." Eilen ran to fetch a comforter, and somebody else shoved a tumbler of amber liquid into Venera's hand. She stared at it for a moment, then drank.

For a few minutes she listened without comprehension to their conversation; then, as if a switch had been thrown somewhere inside her, she realized where she must be and she understood something. She looked at Odess. "This is your new office," she said.

They all stopped talking. Odess came to sit next to her. "That's right," he said. "The diplomatic corps has been exalted since you left."

Eilen laughed. "We're the new stars of Liris! Not that the cherry trees are any less important, but—"

"Moss understands that we need to open up to the outside world," interrupted Odess. "It could never have happened under Margit."

Venera half smiled. "I suppose I can take some credit for making that possible."

"My dear lady!" Odess patted her hand. "The credit is all yours! Liris has come alive again because of you. You don't think we would abandon you in your hour of need, do you?"

"You will always have a place here," said Eilen.

Venera started to cry.

"We would never have told," Odess said a few minutes later. "None of us."

Venera grimaced. She stood at a mirror where she was dabbing at her eyes, trying to erase the evidence of tears. She didn't know what had come over her. A momentary madness; at least it was only the Lirisians who had witnessed her little breakdown. "I suppose it was Sarto," she said. "It hardly matters now. I can't show my face up there without Guinevera putting a bullet in me."

Odess *hmmphed,* wrapping his arms around his barrel chest and pacing. "Guinevera has impressed no one since he arrived. Why should any of your other allies listen to him?"

She turned, raising an eyebrow. "Because he's the ruler of a council nation?"

Odess made a flicking motion. "Aside from that."

With a shake of her head Venera returned to the divan. She could hear gunfire and shouting through the opened window, but it was filtered through the roar of the world-edge winds that tumbled above the courtyard shaft. You could almost ignore it.

In similar fashion, Venera could almost ignore the emotions overflowing

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

her. She'd always survived through keeping a cool head, and this was no time to have that desert her. It was inconvenient that she felt so abandoned and lost. Inconvenient to feel so grateful for the simple company of her former coworkers. She needed to recover her poise, and then act in her own interests as she always had before.

There was a commotion in the corridor, then someone burst through the doors. He was covered in soot and dust, his hair a shock, the left arm of his jacket in tatters.

Venera leaped to her feet. "Garth!"

"There you are!" He rushed over and hugged her fiercely. "You're alive!"

"I'm—oof! Fine. But what happened to you?"

He stepped back, keeping his hands on her arms. Garth had a crazed look in his eye she'd never seen before. He wouldn't meet her gaze. "I was looking for you," he said. "Outside. The rest of them, they're all out there, fighting around the foot of the building. Sacrus has ringed us, they want something here very badly, and our relief force is trying to break through from the outside. So Anseratte and Thinblood are leading the Liris squads in an attempt to break out—make a corridor . . ."

Venera nodded. The irony was that this fight was almost certainly about her, but Anseratte and the others wouldn't know it. Sacrus wanted the key, and they knew Venera was here. Naturally, they would throw whatever they had at Liris to get it.

If Guinevera had tossed her off the roof half an hour ago, the battle would already be over.

Garth toyed with the ripped fringe of his coat for a moment, then burst out with, "Venera, I am so, so sorry!"

"What?" She shook her head, uncomprehending. "Things aren't so bad. Or do you mean . . . ?" She thought of Bryce, who might be lying twisted and broken at the foot of the wall. "Oh," she said, a twisting feeling running through her.

He had just opened his mouth—doubtless to tell her that Bryce was dead—when the noises outside changed. The gunfire, which had been muffled with distance and indirection, suddenly sounded loud and close. Shouts and screams rang through the open windows.

Venera ran over, and with Odess and Eilen craned her neck to look up the shaft of the courtyard. There were people on the roof.

She and Odess exchanged a look. "Are those our . . . ?" she started to say, but the answer was clear.

"Sacrus is inside the walls!" The cry was taken up by the others and suddenly everyone was running for the doors, streaming past Garth Diamandis who was speaking but inaudible through the jumble of shouts.

Venera paused long enough to shrug at him, then grabbed his arm and hauled him after her into the corridor.

The whole population of Liris was running up the stairs. They carried pikes, kitchen knives, makeshift shields, and clubs. None had on more than the clothing they normally wore, but that meant they were formidably armored. There were one or two soldiers in the mix—probably the men who had been guarding Jacoby Sarto. They were frantically trying to keep order in the pushing mass of people.

Garth stared at the crowd and shook his head. "We'll never get through that."

Venera eyed the window. "I have an idea."

As she slung her leg over the lintel Garth poked his head out next to her and looked up. "It's risky," he said. "Somebody could just kick us off before we can get to our feet."

"In this gravity, you're looking at a sprained ankle. Come on." She climbed rapidly, emerging into the light of flares and the sound of gunfire. Half the country was struggling with something at the far end of the roof. Venera blinked and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

squinted, and realized what it was: they were trying to dislodge a stout ladder that had been swung against the battlements. Even as that came clear to her, she saw the gray crosshatch of another emerge from the darkness to thud against the stonework.

Withering fire from below prevented the Lirisians from getting near the things. They were forced to crouch a few feet back and poke at them with their pikes.

A third ladder appeared, and suddenly men were swarming onto the roof. The Lirisians stood up. Venera saw Eilen raise a rusted old sword as a figure in red-painted iron armor reared above her.

Venera raised her pistol and fired. She walked toward Eilen, firing steadily until the man who'd threatened her friend fell. He wasn't dead—his armor was so thick that the bullets probably hadn't penetrated—but she'd rattled his skull for sure.

She was five feet away when her pistol clicked empty. This was the gun Corinne had given her; she had no idea whether it took the same caliber of bullets as anything the Lirisians used. Examining it quickly, she decided she didn't even know how to breach it to check. At that moment two men like metal beetles surmounted the battlement, firelight glistening off their carapaces.

She tripped Eilen, and when the woman had fallen behind her, Venera stepped between her and the two men. She drop-kicked the leader and he windmilled his arms for a moment before falling back. The force of her kick had propelled Venera back ten feet. She landed badly, located Eilen, and shouted, "Come on!"

Moss straight-armed a pike into the helmet of the other man. Beside him Odess shoved a lighted torch at a third who was stepping off the ladder. Gunfire sounded and somebody fell, but she couldn't see who through the press of bodies.

She grabbed Eilen's arm. "We need guns! Are there more in the lockers?"

Eilen shook her head. "We barely had enough for the soldiers. There's that." She pointed.

Around the corner of the courtyard shaft, the ancient, filigreed morning gun still sat on a tripod under its little canopy. Venera started to laugh, but the sound died in her throat. "Come on!"

The two women wrestled the weapon off its stand. It was a massive thing, and though it weighed little in this gravity, it was difficult to maneuver. "Do we have shells?" Venera asked.

"Bullets, no shells," said Eilen. "There's black powder in that bin."

Venera opened the gun's breach. It was of a pointlessly primitive design. You poured black powder into it and then inserted the bullet and closed the breach. It had a spark wheel instead of a percussion trigger. "Well, then, come on." Eilen grabbed up the box of bullets and a sack of powder, and they ran along the inner edge of the roof. In the darkness and confusion Eilen stumbled, and Venera watched as the bullets spilled out into the air over the courtyard. Eilen screamed in frustration.

One bullet spun on the flagstones at Venera's feet. Cradling the gun, she bent to pick up the metal slug. A wave of cold prickles swept over her shoulders and up her neck.

This bullet was identical to the one that nestled inside her jacket—identical save for the fact that it had never been fired.

She couldn't believe it. The bullet she carried—that had sailed a thousand miles through the airs and clouds of Virga, avoiding cities and farms, adeptly swerving to avoid fish and rocks and oceanic balls of water, this bullet that had lined up on Slipstream and the city of Rush and the window in the admiralty where Venera stood so innocently; had smashed the glass in a split-second and buried itself in her jaw, spinning her around and nailing a sense of injured outrage to Venera forever—it had come

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

from here. It had not been fired in combat. Not in spite. Not for any murderous purpose, but for tradition, and to celebrate the calmness of a morning like any other.

Venera had fantasized about this moment many times. She had rehearsed what she would say to the owner of the gun when she finally found him. It was a high, grand, and glorious speech that, in her imagination, always ended with her putting a bullet in the villain. Cradling this picture of revenge to herself had gotten her through many nights, many cocktail parties where out of the corner of her eye she could see the ladies of the admiralty pointing to her scar and murmuring to one another behind their fans.

"Huh," she said.

"Venera? Are you all right?"

Venera shook her head violently. "Powder. Quick!" She held out the gun, and Eilen filled it. Then she jammed the clean new bullet into the breach and closed it. She lofted the gun and spun the wheel.

"Everybody down!" Nobody heard her, but luckily a gap opened in the line at the last second. The gun made a huge noise and nearly blew Venera off the roof. When the vast plume of smoke cleared she saw nearly everybody in sight recovering from having ducked.

It might not be powerful or accurate, but the thing was *loud*. That fact might just save them.

She ran toward the Lirisians. "The cannons! Start shouting stuff about cannons!" She breached the smoking weapon and handed it to Eilen. "Reload."

"But we lost the rest of the bullets."

"We've got one." She reached into her jacket pocket. There it was, its contours familiar from years of touching. She brought out her bullet. Her fingers trembled now as she held it up to the red flare light.

"Damn you anyway," she whispered to it.

Eilen glanced up, said, "Oh," and held up the gun. There was no time for ceremony; Venera slid the hated slug into the breach and it fit perfectly. She clicked it shut.

"Out of my way!" She crossed the roof in great bounding steps, dodging between fighting men to reach the battlement where the ladders jutted up. The gunfire from below had stopped; the snipers didn't want to hit their own men as they topped the wall. Venera hopped up onto a crenel and sighted nearly straight down. She saw the startled eyes of a Sacrus soldier between her feet, and half a dozen heads below his. She spun the spark wheel.

The explosion lifted her off her feet. Everything disappeared behind a ball of smoke. When she staggered to her feet some yards away, Venera found herself surrounded by cheering people. Several of Sacrus's soldiers were being thrown off the roof, and for the moment no more were appearing. As the smoke cleared she saw that the top of the ladder she'd fired down was missing.

"Keep filling it," she said, thrusting the gun at Eilen. "Bullets don't matter—as long as it's bright and loud."

Moss's grinning face emerged from the gloom. "They're hesitating!"

She nodded. Sacrus didn't have so many people that they could afford to sacrifice them in wave attacks. The darkness and confusion would help; and though they had probably heard it every day of their lives, the thunderous sound of the morning gun at this close range would give pause to the men holding the ladders.

"It's not going to keep them at bay for long, though," she said. "Where are the rest of our people?"

Now Moss frowned. "T-trapped, I fear. Guinevera l-led them into an ambush. Now they have their backs to the open air." He pointed toward the edge of the world and the night skies beyond.

Venera hopped up on the edge of the elevator platform and took a quick look

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

around. Sacrus's people were spread in a thin line around two of the approaches to Liris. On their third side, ragged girders and scoured metal jutted off the end of the world. And on the fourth—behind her—a jumble of brambles, thorn-bushes, and broken masonry formed a natural barrier that Sacrus wasn't bothering to police.

In the darkness beyond, hundreds of torches lit the contours of an army small by Venera's standards, but huge for Spyre. There might be no more than a thousand men there, but that was all the forces that opposed Sacrus on this world.

Spreading away behind that army was the maze of estates that made up Greater Spyre. Somewhere out there was the long low building where the hollowed bomb hung, with its promise of escape.

She turned to Moss. "You need to break through Sacrus's lines. Otherwise, they'll overwhelm us, and then they can turn and face our army with a secure fortress behind them."

He nodded. "But all our leaders are t-trapped."

"Well, not all." She strode across the roof to the battlements that overlooked the bramble-choked acres. He came to stand at her side. Together they gazed out at the army that lay tantalizingly out of reach.

"If the semaphore were working—" She stopped, remembering Bryce. Moss shook his head anyway.

"S-Sacrus has encircled the t-tower. They would read every letter."

"But we need to coordinate an attack—from outside and inside at the same time. To break through . . ."

He shrugged. "Simple matter. If we c-can get one p-person through the lines."

She speculated. If she showed up there among the brambles, would the generals of that army have her arrested? How far had news of her deceptions spread?

"Get them ready," she said. "Everyone into armor, everyone armed. I'll be back in two minutes." She headed for the stairs.

"Where are you g-going?"

She shot him a grim smile. "To check in on our bargaining chip."

Venera ran through empty halls to the old prison on the main floor.

As she'd suspected, the guards had deserted their posts when the roof was attacked. The main door was ajar; Venera slowed when she saw this. Warily, she toed it open and aimed her pistol through. There was nobody in the antechamber. She sidled in.

"Hello?" That was Jacoby Sarto's voice. Venera had never heard him sound worried, but he was clearly rattled by what was happening. *He's never been in a battle before,* she realized—nor had any of these people. It was shocking to think that she was the veteran here.

Venera went on her tiptoes to look through the door's little window into the green-walled reception room. Sarto was the sole occupant of a bench designed to seat thirty; he sat in the very center of a room that could have held a hundred. He squinted at the door, then said, "Fanning?"

She threw open the door and stepped in. "Did you tell them?"

He appeared puzzled. "Tell who what?"

She showed him her pistol; he wouldn't know it was empty. "Don't play games, Sarto. Someone told Guinevera who I really am. Was it you?"

He smiled with a trace of his usual arrogance. He stood up and adjusted the sleeves of the formal shirt he still wore. "Things not going your way out there?"

"Two points," said Venera, holding up two fingers. "First: I'm holding a gun on you. Second: you're rapidly becoming expendable."

"All right, all right," he said irritably. "Don't be so prickly. After all, I came here of my own free will."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"And that's supposed to impress me?" She leaned on the doorjamb and crossed her arms.

"Think about it," he said. "What do I have to gain from revealing who you are?"

"I don't know. Suppose you tell me?"

Now he scowled at her, as if she were some common servant girl who'd had the temerity to interrupt him while he was talking. "I have spent thirty-two years learning the ins and outs of council politics. All that time, becoming an expert—maybe *the* expert—on Spyre, learning who is beholden to whom, who's ambitious and who just wants to keep their heads down. I have been the public face of Sacrus for much of that time, their most important operative, because for all those years, Spyre's politics was all that mattered. But look at what's happening." He waved a hand to indicate the siege and battle going on beyond Liris's thick walls. "Everything that made me valuable is being swept away."

This was not what Venera had been expecting to hear from him. She came into the room and sat down on a bench facing Sarto. He looked at her levelly and said, "Change is inconceivable to most people in Spyre; to them a catastrophe is a tree falling across their fence. A vast political upheaval would be somebody snubbing somebody else at a party. That's the system I was bred and trained to work in. But my masters have always known that there's much bigger game out there. They've been biding their time, lo these many centuries. Now they finally have in their grasp a tool with which to conquer the world—the *real* world, not just this squalid imitation we're standing in. On the scale of Sacrus's new ambitions, all of my accomplishments count for nothing."

Venera nodded slowly. "Spyre is having all its borders redrawn around you. Even if they never get the key from me, Sacrus will be facing a new Spyre once the fighting stops. I'll bet they've been grooming someone young and malleable to take your place in that new world."

He grimaced. "No one likes to be discarded. I could see it coming, though. It was inevitable, really, unless . . ."

"Unless you could prove your continuing usefulness to your masters," she said. "Say, by personally bringing them the key?"

He shrugged. "Yesterday's council meeting would otherwise have been my last public performance. At least here, as your, uh, guest, I might have the opportunity to act as Sacrus's negotiator. Think about it—you're surrounded, outgunned, you're approaching the point where you have to admit you're going to lose. But I can tell you the semaphore codes to signal our commanders that we've reached an accommodation. As long as you had power here, you could have functioned as the perfect traitor. A few bad orders, your forces ordered into a trap, then it's over the wall for you and I, the key safely into my master's hands, you on your way home to wherever it is you came from."

Venera tamped down on her anger. Sarto was used to dealing in cold political equations; so was she, for that matter. What he was proposing shouldn't shock her. "But if I'm disgraced, I can't betray my people."

"Your usefulness plummets," he said with a nod. "So, no, I didn't tattle on you. You're hardly of any value now, are you? All you've got is the key. If your own side's turned against you, your only remaining option is to throw yourself on the mercy of Sacrus. Which might win me some points if I'm the one who brings you in, but not as much, and—"

"—And I have no reason to expect good treatment from them," she finished. "So why should I do it?"

He stood up—slowly, mindful of her gun—and walked a little distance away. He gazed up at the room's little windows. "What other option do you have?" he asked.

She thought at first that he'd said this

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

rhetorically, but something about his tone . . . It had sounded like a genuine question.

Venera sat there for a while, thinking. She went over the incident with the council members on the roof; who could have outted her? Everything depended on that—and on when it had happened. Sarto said nothing, merely waited patiently with his arms crossed, staring idly up at the little window.

Finally she nodded and stood up. "All right," she said. "Jacoby, I think we can still come to an . . . accommodation. Here's what I'm thinking . . ."

19

As sometimes happened at the worst of moments, Venera lost her sense of gravity just before she hit the ground. The upthrusting spears of brush and stunted trees flipped around and became abstract decorations on a vast wall she was approaching. Her feet dangled over sideways buildings and the pikes of soldiers. Then the wall hit her, and she bounced and tumbled like a rag doll. Strangely, it didn't hurt at all—perhaps not so strangely, granted that she was swaddled in armor.

She unscrewed her helmet and looked up into a couple of dozen gun barrels. They were all different, like a museum display taken down and offered to her; in her dazed state she almost reached to grab one. But there were hands holding them tightly and grim men behind the hands.

When she and Sarto had reached the rooftop of Liris, they found a theatrical jumble of bodies, torn tenting, and brazier fires surrounded by huddling men in outlandish armor. At the center of it all, the thick metal cable that rose up and out of sight into the turbulent mists; that cable glowed gold now as distant Candesce awoke.

She had spotted Moss and headed over, keeping her head down in case there were snipers. He looked up, lines of exhaustion apparent around his eyes. Glancing past her, he spotted Sarto. "What's this?"

"We need to break this siege. I'm going over the wall, and Sarto is coming with me."

Moss blinked, but his permanently shocked expression revealed none of his thoughts. "What for?"

"I don't know whether the commanders of our encircling force have been told that I'm an imposter and traitor. I need to bring Jacoby Sarto in case I need a . . . ticket, I suppose you could call it . . . into their good graces."

He nodded reluctantly. "And how do you p-propose to reach our force? S-Sacrus is between us and them."

Now she grinned. "Well, you couldn't do this with all of us, but I propose that we *jump.*"

Of course they'd had help from an ancient catapult that Liris had once used to fire mail and parcels over an enemy nation to an ally some three miles away. Venera had seen it on her second day here; with a little effort, it had been refitted to seat two people. But nobody, least of all her, knew whether it would still work. Her only consolation had been the low gravity in Spyre.

Now Venera had two possible scripts she could follow, one if these were soldiers of the Council Alliance, one if they owed their allegiance to Sacrus. But which were they? The fall had been so disorienting that she couldn't tell where they'd ended up. So she merely put up her hands and smiled and said, "Hello."

Beside her Jacoby Sarto groaned and rolled over. Instantly another dozen guns aimed at him. "I think we're not that much of a threat," Venera said mildly. She received a kick in the back (which she barely felt through the metal) for her humor.

A throb of pain shot through her jaw—and an odd thing happened. Such spasms of pain had plagued her for years, ever since the day she woke up in Rush's military infirmary, her head bandaged like a delicate vase about to be

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

shipped via the postal system. Each stab of pain had come with its own little thought, whose content varied somewhat but always translated roughly to either *I'm all alone* or *I'm going to kill them*. Fear and fury, they stabbed her repeatedly throughout each day. The fierce headaches that often built over the hours just added to her meanness.

But she'd taken the bullet that struck her jaw and blown it back out the very same gun that had shot her. So, when her jaw cramped this time, instead of her usual misery, Venera had a flash of memory: the morning gun going off with a tremendous explosion in her hands, bucking and kicking and sending her flying backward into the Lirisians. She had no idea what the feeling accompanying that had been, but she liked it.

So she grinned crookedly and stood up. Dusting herself off, she said with dignity, "I am Amandera Thrace-Guiles, and this is Jacoby Sarto of the Spyre Council. We need to talk to your commanders."

"You have a reputation for being foolhardy," said the army commander, his gray mustaches waggling. "But that was ridiculous."

It turned out that they'd nearly overshot both Sacrus and Council Alliance positions. Luckily, several hundred pairs of eyes had tracked their progress across the rolled-up sky of Spyre and it was her army that had gotten to Venera and Jacoby first. Sarto didn't seem too upset about the outcome, which was telling. What was even more significant was that everyone was calling her "Lady Thrace-Guiles," which meant that word of her deceptions hadn't made it out of Liris. Here, Venera was still a respected leader.

She preened at the commander's backhanded compliment. He stood with his back to a brick wall, a swaying lamp nodding shadows across the buttons of his jacket. Aides and colonels bustled about, some shoving little counters across the map board, others reading or writing dispatches.

Venera smelled engine oil and wet cement. The alliance army had set up its headquarters in a preservationist roundhouse about a mile from Liris; these walls were thick enough to stop anything Sacrus had so far fired. For the first time in days, Venera felt a little safe.

"I wouldn't have had to be foolhardy if the situation weren't so dire," she said. It was tempting to upbraid this man for hesitating to send his forces to relieve Liris; but Venera found herself uninterested anymore in taking such familiar pleasures. She merely said, "Tell me what's been happening out here."

The commander leaned over the board and began pointing at the little wooden counters. "There've been engagements all across Greater Spyre," he said. "Sacrus has won most of them."

"So what are they doing? Conquering countries?"

"In one or two cases, yes. Mostly they've been cutting the preservationist's railway lines. And they've taken or severed all the elevator cables."

"Severed?" Even to an outsider like her this was a startling development.

One of the aides shrugged. "Easy enough to do. They just use them for target practice—except for the ones at the edge of the world, like Liris. The winds around those lines deflect the bullets."

She raised her eyebrows. "Why don't they just use more high-powered guns on them?" The aide shook his head.

"Ancient treaty. Places limits on muzzle velocities. It's to prevent accidental punctures of the world's skin."

"—Not significant, anyway," said the commander with an impatient gesture. "The war will be decided here on Greater Spyre. The city will just have to wait it out."

"No, it can't wait," she said. "That's what this is all about. Not the city, but the docks."

"The docks?" The commander stared at her. "That's the last thing we're going

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

to worry about."

"I know, and Sacrus is counting on that." She glared at him. "Everything that's happening down here is a diversion from their real target. Everything except . . ." She nodded at Liris.

Now they were looking at each other with faintly embarrassed unease. "Lady Thrace-Guiles," said the commander, "war is a very particular art. Perhaps you should leave such details to those who've made it their careers."

Venera opened her mouth to yell at him, thought better, and took a deep breath instead. "Can we at least be agreed that we need to break Sacrus's hold on Liris?"

"Yes," he said with a vigorous nod. "We need to ensure the safety of our leadership. For that purpose," he pointed at the table, "I am advocating a direct assault along the innermost wall."

A moment of great temptation made Venera hesitate. The commander was proposing to go straight for the walls and leave the group trapped at the world's edge to its fate. He didn't know that his objective was actually there. They'd made themselves her enemies and Venera could just . . . forget to tell him. Leave Guinevera and the others to Sacrus's mercy now that she had the army.

She couldn't claim not to have known, though, unless the Lirisians went along with it. And she was tired of deceptions. She sighed and said, "Liris is a critical objective, yes, but the rest of our leadership is actually trapped with the Lirisian army at the edge of the world." There were startled looks up and down the table. "Yes—Master Thinblood, Principe Guinevera, and Pamela Anseratte, among others, are among those pinned down in the hurricane zone."

The commander frowned down at the map. On it, Liris was a square encircled by red wooden tokens representing Sacrus's army. This circle squashed a knot of blue tokens against the bottom edge of the map: the Lirisian army, trapped at the edge of the world. Left of the encirclement was a no-man's land of tough brush that had so far resisted burning. Left of *that,* the preservationist siding and army encampment where they now stood.

"This is a problem," said the commander. He thought for a moment, then said, "There are certain snakes that coil around their victims and choke them to death." She raised an eyebrow, but he continued, "One of their characteristics, so I've been told, is that if you try to remove them they tighten their grip. Right now Sacrus has both Liris and our leaders in its coils, and if we try to break through to one they will simply strangle the other."

To relieve the Lirisian army, they would have to force a wedge under Liris, with the edge of the world at their right side. To do this they would trade off their ability to threaten Sacrus along the inner sides of Liris—freeing those troops up to assault the walls of Liris. Conversely, the best way to relieve Liris would be to come at it from the top, which meant swinging the army away from the world's edge—thus giving Sacrus a free hand against the trapped force.

Venera examined the map. "We have to fool them into making the wrong choice," she said.

"Yes, but how are we going to do that?" He shook his head. "Even if we did, they can maneuver just as fast as we can. They have less ground to cover than we do to redeploy their forces."

"As to how we'll fool the snake into uncoiling," she said, "it helps to have your own snake to consult with." She turned and waved to some figures standing a few yards away. Jacoby Sarto emerged from the shadows; he was a silhouette against Klieg lights that pinioned a pair of hulking locomotives in the center of the roundhouse. He was accompanied by two armed soldiers and a member of Bryce's underground.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The commander bowed to Sarto, but then said, "I'm afraid we cannot trust this man. He is of the enemy."

"Lord Sarto has seen the light," said Venera. "He has agreed to help us."

"Pah!" The commander sneered. "Sacrus are masters of deception. How can we trust him?"

"The politics are complex," she said. "But we have very good reasons to trust him. I do. That is why I brought him."

There were more glances thrown between the colonels and the aides. The commander twitched a frown for just a moment, then said, "No—I understand the dilemma we're in, but my sovereign and commanding officer is Principe Guinevera, and he's in danger. *Politically,* saving our leadership has to be the priority. I'll not countenance any plan that weakens our chance of doing that."

Jacoby Sarto laughed. It was an ugly, contemptuous sound, delivered by a man who had spent decades using his voice to wither other men's courage. The commander glared at him. "I fail to see the humor in any of this, Lord Sarto."

"Forgivable," said Sarto dryly, "as you're not aware of Sacrus's objectives. They want Liris, not your management. They haven't crushed the soldiers pinned down at the world's edge because they're dangling them as bait."

"What could they possibly want with Liris?"

"Me," said Venera, "because they surely think I'm still there—and the elevator cable. They need to cut it. All they have to do is capture me or make it impossible for me to leave Greater Spyre. Then they've won. It will just be a matter of time."

Now it was the commander's turn to laugh. "I think you vastly overrate your own value, and underrate the potential of this army," he said, sweeping his arm to indicate the paltry hundreds gathered in the cavernous shed. "You alone can't hold this alliance together, Lady Thrace-Guiles. And I said it before, the elevator cables are of little strategic interest."

Venera was furious. She wanted to tell him that she'd seen more men gathered at circuses in Rush than he had in his vaunted army. But, remembering how she had thrown a lighted lamp at Garth in anger and his gentle chiding after, she bit back on what she wanted to say, and instead said, "You'll change your mind once you know the true strategic situation. Sacrus wants—" She stopped as Sarto touched her arm.

He was shaking his head. "This is not the right audience," he said quietly.

"Um." In an instant her understanding of the situation flipped around. When she had walked in here she had seen this knot of officers in one corner of the roundhouse and assumed that they were debating their plan of attack. But that wasn't what they were doing at all. They had been *huddling* here, as far as possible from the men they must command. They weren't planning; they were hesitating.

"Hmmm . . ." She quirked a transparently false smile at the commander. "If you men will excuse me for a few minutes?" He looked puzzled, then annoyed, then amused. Venera took Sarto's arm and led him away from the table.

"What are you going to do?" he asked.

She stopped in an area of blank floor stained over the decades by engine oil and grease. At first Venera didn't meet Sarto's eyes. She was looking around at the towering wrought-iron pillars, the tessellated windows in the ceiling, the smoky beams of light that intersected on the black backs of the locomotives. A deep knot of some kind, loosened when she cried in Eilen's arms, was unraveling.

"They talk about places as being our homes," she mused. "It's not the place, really, but the people."

"I'm sure I don't know what you mean," he said. His dry irony had no effect on Venera. She merely shrugged.

"You were right," she said. He cocked his head to one side, crossing his arms, and waited. "After the confirmation,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

when you said I was still Sacrus's," she went on. "And in the council chamber, even when we talked in your cell earlier tonight. Even now. As long as I wanted to leave Spyre, I was theirs. As long as they've known what to dangle in front of me, there was nothing I could do but what they wanted me to do."

"Haven't I said that repeatedly?" He sounded annoyed.

"All along, there's been a way to break their hold on me," she said. "I just haven't had the courage to do it."

He grumbled, "I'd like to think I made the right choice by throwing in with you. Takes you long enough to come to a decision, though."

Venera laughed. "All right. Let's do this." She started to walk toward the locomotives.

"There you are!" Venera stumbled, cursed, and then flung out her arms.

"Bryce!" He hugged her, but hesitantly—and she knew not to display too much enthusiasm herself. No one knew they were lovers; that knowledge would be one more piece of leverage against them. So she disengaged from him quickly and stepped back. "What happened? I saw the semaphore station blown up. We all assumed you were . . ."

He shook his head. In the secondhand light he did look a bit disheveled and soot stained. "A bunch of us got knocked off the roof, but none of us were hurt." He laughed. "We landed in the brambles and then had to claw our way through with Sacrus's boys firing at our arses all the way. Damn near got shot by our own side as well, before we convinced them who we were."

Now she did hug him and damn the consequences. "Have you been able to contact any of our—your people?"

He nodded. "There's a semaphore station on the roof. The whole Buridan network's in contact. Do you have orders?"

As Venera realized what was possible, she grinned. "Yes!" She took Bryce by one arm and Sarto by the other and dragged them across the floor. "I think I know a way to break the siege and save the other commanders. You need to get up there and get Buridan to send us something. Jacoby, you get up there too. You need to convince Sacrus that I'm ready to double-cross my people." She pushed them both away.

"And what are you going to do?" asked Bryce.

She smiled past the throbbing in her jaw. "What I do best," she said. "I'll set the ball rolling."

Venera stalked over to the black, bedewed snout of a locomotive and pulled herself up to stand in front of its headlamp. She was drenched in light from it and the overhead spots, aware that her pale face and hands must be as bright as lantern flames against the dark metal surrounding her. She raised her arms.

"It is *tiiiiime!"*

She screamed it with all her might, squeezed all the anger and the pain from her twisted family and poisonous intrigues of her youth, the indifferent bullet and her loss of her husband Chaison, the blood on her hands after she stabbed Aubri Mahallan, the smoke from her pistols as she shot men and women alike, all of it into that one word. As the echoes subsided everyone in the roundhouse came to their feet. All eyes were on her and that was exactly right, exactly how it should be.

"Today the old debts will be settled! Two hundred years and more the truth has waited in Buridan tower—the truth of what Sacrus is and what they have done! Nearly too late, but not too late, because you, here today, will be the ones to settle those debts and at the same time, prevent Sacrus from ever committing such atrocities again!

"Let me describe my home. Let me describe Buridan tower!" Out of the corner of her eye she saw the army commanders running from their map table, but they had to shoulder their way through hundreds of soldiers to reach her, and the soldiers were raptly attentive to her alone. "Like a vast musical in-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

strument, a flute thrust into the sky and played on by the ceaseless hurricane winds of the airfall. Cold, its corridors decorated with grit and wavering, torn ribbons that once were tapestries. Wet, with nothing to burn except the feathers of birds. Never silent, never still as the beams it stands on sway under the onslaught of air. A roaring tomb, that is Buridan tower! That is what Sacrus made. It is what they promise to make of your homes as well, make no mistake.

"That's right," she nodded. "You're fighting for far more than you may know. This isn't just a matter of historical grudges, nor is it a skirmish over Sacrus's kidnapping and torture of your women and children. This is about your future. Do you want all of Spyre to become like Buridan, an empty tomb, a capricious playground for the winds? Because that is what Sacrus has planned for Spyre."

The officers had stopped at the head of the crowd. She could see that the commander was about to order her to be taken off her perch, so Venera hurried on to her main point. "You have not been told the truth about this war! Before we leave this place you need to know why Sacrus has moved against us all. It is because they believe they have outgrown Spyre the way a wasp outgrows its cocoon. Centuries ago they attacked and destroyed Buridan to gain a treasure from us. They failed to capture it, but never gave up their ambition. Ever since Buridan's fall they have bided their time, awaiting the chance to get their hands on something Buridan has guarded for the sake of Spyre, since the very beginning of time." She was really winding herself up now, and for the moment the officers had stopped, curious no doubt about what she was about to say.

"Since the creation of Spyre, my family has guarded one of the most powerful relics in the world! It was for the sake of this trust that we kept to Buridan tower for generations, not venturing out because we feared Sacrus would learn that the tower is not the empty shell they believed—afraid they would learn that it can be entered. The thing we guarded is so dangerous that my brothers and sisters, my parents, grandparents, and their grandparents, all sacrificed their lives to prevent even a hint of its existence from escaping our walls.

"Time came when we could no longer sustain ourselves," she said more softly, "and I had to venture forth." Dimly, Venera wondered at this grand fib she was making up on the spot; it was a rousing story, and if it proved rousing enough, then nobody would believe Guinevera if he survived to accuse her of being an imposter.

"As soon as I came forth," she said, "Sacrus knew that Buridan had survived, and they knew *why* we had stayed hidden. They knew that I carried with me the last key to Candesce!"

She stopped, letting the echoes reverberate. Crossing her arms, she gazed out at the army, waiting. Two seconds, five, ten, and then they were muttering, talking, turning to one another with frowns and nods. Some who prided themselves on knowing old legends told the men standing next to them about the keys; word began to spread through the ranks. In the front row, the officers were looking at one another in consternation.

Venera raised a hand for silence. "That is what this war is about," she said. "Sacrus has known of the existence of this key for centuries. They tried to take it once, and Buridan and its allies resisted. Now they are after it again. If they get it, they will no longer need Spyre. To them it is like the hated chrysalis that has confined them for generations. They will shed it, and they don't care if it unravels in pieces as they fly toward the light. At best, Spyre will prove a good capital for the world-spanning empire they plan—once they've scoured it clean of all the old estates, that is. Yes, this cylinder will make a fine park for the palace of Virga's new rulers. They'll

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

need room for the governors of their new provinces, for prisoners, slaves, treasure houses, and barracks. They might not knock down *all* the buildings. But you and yours . . . well, I hope you have relatives in one of the principalities, because rabble like us won't be allowed to live here anymore."

The soldiers were starting to argue and shout. Belatedly the officers had realized that they weren't in control any more; several darted at the locomotive, but Venera crouched and glared at them, as if she was ready to pounce. They backed away.

She stood up onto her tip-toes as she flung one fist high over her head. "We have to stop them! The key must be protected, for without it, Spyre itself is doomed. You fight for more than your lives—more than your homes. You are all that stands between Sacrus and the slow strangulation of the very world!

"Will you stop them?" They shouted yes. "*Will* you?" They screamed it.

Venera had never seen anyone give a speech like this, but she'd heard Chaison work a crowd and had read about such moments in books. It all took her back to those romantic stories she'd devoured as a little girl in her pink bedroom. Outrageous theatricality, but none of these men had ever seen its like either; few had probably ever been in a theater. For most, this roundhouse was the farthest they had ever been from home, and the looming locomotive was something they had only ever glimpsed in the far distance. They stood among peers, who before today had been dots seen through telescopes, and they were learning that however strange and foreign they were, all were united in their loyalty to Spyre itself. Of course the moment made them mad.

Fist still raised, Venera smiled down at the commander who shook his head in defeat.

Bryce and Jacoby Sarto clambered along the side of the locomotive to join her. "What's the news?" she asked over the roar of the army at her feet.

Bryce blinked at the scene. "Uh . . . they're on their way."

Sarto nodded. "I semaphored the Sacrus army commander. Told him you realize your situation is hopeless, that you're going to lead your army into a trap."

She grinned. "Good." She turned back to the crowd and raised her fist again.

"It—is—*tiiiiiiiiime!*"

20

The sound of bullets hitting Liris's walls reminded Garth Diamandis of those occasional big drops that fall from trees after a rain. Silence, then a *pat* followed in this case by the distant sound of a shot. From the gunslit where he was watching he could see the army of the Council Alliance assembling next to the rust-streaked roundhouse. In the early morning light it seemed like a dark carpet moving, in ominous silence, in the direction of Liris. Little puffs of smoke arose from the Sacrus line, but the firing was undisciplined.

"Come away from there," said Venera's friend Eilen. They stood in a musty closet crammed with door lintels, broken drawers, cracked table legs: useless junk, but impossible for a tiny nation like Liris to throw away. Lantern light from the corridor shone through Eilen's hair. She could have been attractive, a habitual part of his mind noted. At one time, he could have helped her with that.

"I have a good view of the Sacrus camp," he said. "And it's too dangerous to be on the roof right now."

"You'll get a bullet in the eye," she said. He grunted and turned back to the view, and after a moment he heard her leave.

He couldn't tell her that he had recognized one of the uniformed figures moving down there—maybe two of them, he couldn't be sure. Garth was sure that Eilen would tell him he was suffering an old man's delusions if he said he'd rec-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ognized his daughter among the hundreds of crimson uniforms.

He could be imagining it. He'd had scant moments to absorb the sight of her before she'd signaled her superiors and Sacrus's thugs had moved in on him. Yet Garth had an eye for women, was able to recall the smallest detail about how this or that one moved or held herself. He could deduce much about character and vulnerability by a woman's stance and habitual gestures, and he damned well knew how to recognize one at a distance. That was Selene standing hipshot by that tent, he was sure of it.

Garth cursed under his breath. He'd never been one to probe at sore spots, but ever since they'd thrown him into that stinking cell in the Gray Infirmary, his thoughts had pivoted around the moment of Selene's betrayal.

He had told her that he was her father, just before she betrayed him. In the seconds between, he'd seen the doubt in her eye—and then the mad-eyed woman with the pink hair had come to stand next to Selene.

"He said he's my father," Selene murmured as the soldiers cuffed Garth. The pink-haired woman behind her laughed.

"And who knows?" she'd said. "He might well be." She had laughed again, and Garth had glimpsed a terrible light in his daughter's eye just before he was hauled out of her sight.

There it was again, that mop of blossom-colored hair poking out from under a gray army cap. She was an officer. The last time Garth had seen her had been in a bizarre fever dream where Venera was whispering his name urgently. This woman had been there, among glass cases, but she was naked and laved with crimson from head to toe. Venera had spoken her name then, but Garth didn't remember it.

The sound of firing suddenly intensified. Garth craned his neck to look in the direction of the roundhouse. Sacrus's forces were moving out to engage the council troops on the inside of Liris. Behind him, though, he could see an equally large contingent of Sacrus's soldiers circling back around the building—headed toward the edge of the world.

Garth had some inkling of what the council army was doing. They were pressing up against the no-man's land of thorn and tumbled masonry, a scant hundred yards from the walls of Liris. From there they could turn left or right—inward or toward world's edge—at a moment's notice. Sacrus would have to split their forces into two to guard against both possibilities.

It was an intelligent plan and for a moment Garth's spirits lifted. Then he saw more of Sacrus's men abandon their positions below him. They were leaving a noisy and smoke-wreathed band of some two hundred men to defend the inward side while the rest of their forces marched behind Liris and out of sight from the roundhouse. They clearly expected the council army to split right and try to relieve Guinevera and Anseratte at the hurricane-wracked world's edge. But how did they know what the council was planning?

He cursed and jumped down off the ancient credenza he'd been perched upon. The corridors were stuffed with armed people, old men and women mostly (strange how he thought of other people his age as old, but not himself). He elbowed his way through them carelessly. "Where the hell is Moss?"

Someone pointed down a narrow, packed hallway. Liris's new botanist was deep in discussion with the only one of Bryce's men left inside the walls. "I need semaphore flags," Garth shouted over two shoulders. "We have to warn the troops what Sacrus is doing!"

To his credit, Moss didn't even blink. He raised a hand, pointed to one man, then held up two fingers. "Forward stores," he said. He pointed to another man and then at Garth. "Go with."

It took precious minutes for Garth

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and his new helper to locate the flags. Then they had to fight their way to the stairs. They emerged outside to the mind-numbing roar of the winds and an almost continuous sound of gunfire. Ducking low, they ran for the edge of the roof.

"They expect you to act as if you don't know about the key," Venera was explaining for the tenth time. She was surrounded by nervous officers and staffers; the gray-mustachioed army commander stood with his arms crossed, glowering as she drew on the ground with a stick. "If you don't know about it, then the obvious strategic goal is to relieve Guinevera's force. Jacoby Sarto has told them that we are going to do that. This frees Sacrus to take Liris, their real objective."

The commander nodded reluctantly. A bullet whined past somewhere too near for comfort. They stood behind a screen of brush on the edge of no-man's land. An arc of soldiers surrounded them, far too few for Venera's taste. This force would hardly qualify as a company in Chaison's army. Yet Sacrus didn't have much more.

"So," she continued. "We feint right, then strike left. I humbly suggest that we start with sustained fire into Sacrus's position on the edge side of no-man's land."

There was some talk among the officers—far too much of it to suit her—then the commander said, "It's too risky. And I remain skeptical about your story."

He didn't believe the key was real. Venera was tempted to take it out and show it to him, but that might backfire. Who could believe a whole war would be fought over an ivory wand?

While she and the commander were scowling at one another Bryce ran up, puffing. "They're here!" Venera turned to look where he pointed.

She turned back, grinning broadly. "Commander, would you be more amenable to my plan if you had a secret weapon to help with it?"

The commander and all the officers fell silent as they saw what was approaching. Slowly, the commander began to smile.

"Damn it, they're ignoring us!" Garth ducked as another volley of fire from below raked the edge of the roof. His assistant slumped onto the flagstones next to him, shaking his head.

"Maybe they don't see us," he said.

"Oh, they see us all right. They just don't believe us." Garth risked a glance over the stones. The council army was pressing hard against the barricades hastily thrown up by Sacrus on the inward side of Liris. The bulk of their army was hovering on the far side of the building, ready to speed toward the edge as soon as they were given the word.

Another ladder thunked against the wall. That made four in as many seconds. Garth pushed his companion. "Back to the stairs!" Sacrus was moving to take Liris. There was nothing anyone could do to stop them.

Garth stood up to run, and hesitated for just a second. He couldn't stop himself from looking down through the gunfire and smoke to find his daughter. The ground around Liris was boiling with men; he couldn't see her.

Something hit him hard and he spun around, toppling to the flagstones. A bullet—was he dead? Garth clawed at his shoulder, saw a bright scar on the metal of his armor but no hole.

"Sir!" Damn him, his helper was running back to save him. "No, get to the stairs dammit!" Garth yelled, but it was too late. A dozen bullets hit the man and some of those went right through his armor. He fell and slid forward, and died at Garth's feet.

Garth had never even learned his name.

Up they came now, soldier after soldier hopping onto Liris's roof. One

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

loped forward, ignoring rifle fire from the stairs, and pitched a firebomb into the central courtyard. The cherry trees were protected under a siege roof, but a few more of those and they would burn.

Swearing, he tried to stand. Something hit him again and he fell back. This time when he looked up, it was to see the black globe of a Sacrus helmet hovering above him, and a rifle barrel inches from his face.

Garth fell back, groaning, and closed his eyes.

"We've lost our momentum," said Bryce. He and Venera were crouched behind an upthrust block of brickwork from some ancient, abandoned building. A hundred feet ahead of them, men were dying in a futile attack on the Sacrus barricade.

She nodded, but the council officers were already ordering a retreat. For a few seconds she watched the soldiers scampering back under relentless fire. Then she cocked an eyebrow at Bryce, and grinned.

"*We've* lost *our* momentum? When did you decide this was your fight?"

"People are dying," he said angrily. "Anyway, if what you say is true, there's far more at stake than any of us knew." She shrugged and glanced again at the retreat, but then noticed he was staring at her.

"What?"

"Who are you, really? Surely not Amandera Thrace-Guiles?"

Venera laughed. He hadn't been there for her moment of humiliation at the feet of Guinevera—had, in fact, been flying through the air over brambles and scrub just about then.

She stuck out her hand for him to shake. "Venera Fanning. Pleased to meet you."

He shook it, a puzzled expression on his face, but then a new commotion distracted him. "Look! Your friends . . ."

Through the drifting smoke, she could see a dozen spindly ladders wobbling against the building's walls. Men were swarming up them and there was fighting on the roof. In seconds she could lose the people who had become most precious to her. "Come on!"

They braved rifle fire and ran back. The army commander was crouched over a map. He looked up grimly as Venera approached. "Can you feel it?" When she frowned, he pointed down at the ground. Now she realized that for some time now, she had been feeling a slow, almost subliminal sensation of rising and falling. It was the kind of faint instability of weight that you sometimes felt when a town's engines were working to spin it back up to speed.

"I think Sacrus cut one too many cables."

"Let the preservationists deal with it when we're finished," she said. "Right now we need to cut down those ladders."

He shook his head. "Don't you understand? This is more than just a piece or two falling off the world. Something's happened. It—we . . ." She realized that he was very, very frightened. So were the officers kneeling with him.

Venera felt it again, that long slow waver, unsettling to the inner ear. Way out past the smoke, it seemed like the curving landscape of Spyre was crawling, somehow, like the itchy skin of a giant beast twitching in slow motion.

"We can't do anything about that," she said. "We have to focus on saving lives here and now! Look, I don't think there's more than three dozen men on those barricades. The rest of their men are waiting on the far side for us to try to relieve Guinevera."

With an effort he pulled himself together. "Your plan . . . Can you do it?"

"They'll start to pull back as soon as they realize we're concentrating here," she said. "When they do, we'll have them."

"All right. We have to . . . do something." He got to his feet and began issuing orders. The frightened officers

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sprinted off in all directions. Venera and Bryce ran back in the direction of the roundhouse and as they passed the fringe of the no-man's land she saw scores of men standing up from concealment in the bushes. Suddenly they were all bellowing and as more popped up from unexpected places Venera found herself being swept back by a vast mob of howling armored men. She and Bryce fought their way forward as hundreds of bodies plunged past them. She had no time to look back but could imagine the Sacrus barricades being overwhelmed in seconds; the ladders would tremble and fall, and when they rose again it would be council soldiers climbing them.

A small copse of trees stood at the end of no-man's land; bedraggled and half-burnt, they still made a good screen for what hid behind them. Venera smelled the things before she saw them, and her spirits soared as she heard their nervous snorting and stamping.

With murmurs and an outstretched hand, she approached her Dali horse. A dozen others stood huddled together, flanks twitching, their heads a dozen feet off the earth. All were saddled and some of the horsemen were already mounted.

Bryce stopped short, a wondering expression on his face. Venera put her hand on the rope ladder that led up to her beast's saddle, then looked back at him. "See to your people," she said. "Run your presses. If I live, I'll see you after."

He smiled and for a moment looked boyishly mischievous. "The presses have been running for days, and I've sent my messages. But just in case . . . here." He dug inside his jacket and handed her a cloth-wrapped square. Venera unwrapped it, puzzled, then laughed out loud. It was a brand-new copy of the book *Rights Currencies*. She raised it to her nose and smelled the fresh ink, then stuffed it in her own jacket.

She laughed again as Bryce stepped back and the rest of her force mounted up behind her. Venera turned and waved to them, and as Bryce ran back toward the roundhouse and safety, she yelled, "Come *on!* They're not going to be expecting *this!*"

Garth could see it all. They'd tied his hands behind him and stood him near the body of the man who'd come with him to the roof. From behind him came the sounds of Sacrus's forces mopping up on the lower floors of Liris. Prisoners were being led onto the roof under the direction of the pink-haired woman, whose name, he now remembered, was Margit. She had climbed up the ladder with ferocious energy a few minutes before.

Garth had turned away when his daughter stepped onto the roof behind her.

Turning, he saw what was developing under the shadow of the building, and despite all the tragedy it made him smile.

A dozen horses, each one at least ten feet tall at the shoulder, were stepping daintily but rapidly through no-man's land. The closely packed thorn bushes and tumbled masonry were no barrier to them at all. Each mount held two riders except the one in the lead. Venera Fanning rode that one, a rifle held high over her head. Garth could see that her mouth was wide open—Mother of Virga, was she howling some outlandish battle cry? Garth had to laugh.

"What's so funny, you?" A soldier cuffed him on the side of his head. Garth looked him in the eye and nodded in Venera's direction.

"That," he said.

After he finished swearing, the man ran toward Margit, shouting, "Sir! Sir!" Garth turned back to the view.

Sacrus had taken Liris with a comparatively small force, and was now depleted on the Spyre side of the building. The bulk of the council army was wheeling in that direction, pushing back the few defenders on the barricades. They'd

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

take the siege ladders on that side in no time. It shouldn't have been a problem for Sacrus; they now held the roof and could lower ladders, ropes, and platforms to relieve their own forces from the other side of the building. Now that they knew where the council army was going, their ground forces had started running back in that direction from the world's edge. This seemed safe because they had a large force below no-man's land to block any access from the direction of the roundhouse.

But Venera's cavalry had just crossed *over* no-man's land and were now stepping into the strip of cleared land next to the building. Without hesitation they turned right and galloped at the rear of the Sacrus line. Simultaneously, those council troops fronting the roundhouse assaulted them head-on.

A hysterical laugh pierced the air. Garth turned to see Margit perched atop the wall. She was staring down at the horses with a wild look in her eye. "I'm seeing things in broad daylight now," she said, and laughed again. "This is a strange dream, this one. Things with four legs . . . taller than a man . . ."

Selene reached up to take Margit's arm, but the former botanist batted her hand aside. Stepping back, her face full of doubt, Selene looked around—and her eyes met Garth's. He frowned and shook his head slowly.

Angrily, she turned away.

The twelve horses stepped over a barricade while their riders shot the men behind it. The horses were armored, Garth saw, although he was sure it wouldn't prove too effective under direct fire. Sacrus's men weren't firing, though. They were too amazed at what they were seeing. The beasts towered over them, huge masses of muscle on impossibly long legs, festooned with sheet metal barding that half hid their giant eyes and broad teeth. The monsters were overtop and past and wheeling before the defenders could organize. And by then bullets and flicking hooves were finding them, and they all fell.

Margit stood there and watched while the commanders on the ground shouted and waved. The other men on the rooftop stared at the fiasco unfolding below them, then looked to Margit. The seconds dragged.

In that time the horses reached a point midway between the bottled-up council leadership and the Sacrus force below no-man's land. Now they split into two squads of six. Venera led hers in a thunderous charge directly at the men who had pinned down Guinevera and the Liris army.

Selene jumped onto the wall beside Margit. She stared for a second, then cursed and whirling, shouted, "Shoot! Shoot, you idiots! They're going to—"

Margit seemed to wake out of her trance. She stepped grandly down from the wall and frowned at the line of prisoners that had been led onto the roof. She strolled over, loosening a pistol at her belt.

"Where is Venera Fanning?" she shouted.

A sick feeling came over Garth. He watched Margit walk up and down the line, saw her pause before Moss, sneer at Samson Odess, and finally stop in front of Eilen.

"You were her friend," she said. "You'll know where she is." She raised the pistol and aimed it between Eilen's eyes.

Garth tried to run over to her, but a soldier kicked his legs out from under him and only the light gravity saved him from breaking his nose as he fell. "She's right there!" Garth hollered at Margit. "Riding a horse! You were just looking at her."

Margit glanced back. Her eyes found Garth lying prone on the flagstones.

"Don't be ridiculous," she said with a smile. "Those things weren't *real.*"

She shot Eilen in the head.

Venera's friend flopped to the rooftop in a tumble of limbs. The other captives screamed and quailed. "Where is she?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

shrieked Margit, waving the pistol. Now, too late, Selene was running to her side. The younger woman put her hand on Margit's arm, spoke in her ear, tugged her away from the prisoners.

As she led Margit away Selene glanced over at Garth. It was his turn to look away.

There was a lot of running and shouting then, though little shooting because, he supposed, the men on the roof were afraid of hitting their own men. Garth didn't care. He lay on his stomach with his cheek pressed against the cold stone and cried.

Someone hauled him to his feet. Dimly he realized that a great roaring sound was coming from beyond the roof's edge. Now the men on the roof did start firing—and cursing, and looking at one another helplessly.

Garth knew exactly what had happened. Venera had broken the line around Guinevera's men. They were pouring out of their defensive position and attacking Sacrus's force beneath no-man's land. That group was now itself isolated and surrounded.

He wouldn't be surprised if Venera herself had moved on, perhaps circling the building to connect up with the main bulk of the council army. If she did that, then none of the ladders and elevator platforms to this roof would be safe for Sacrus.

"Come on." Garth was hauled to his feet and pushed to the middle of the roof. He coughed and realized that smoke was pouring up from the courtyard. The prisoners were wailing and screaming.

Margit's soldiers had set the cherry trees alight.

"Get on the platform or I'll shoot you." Garth blinked and saw that he was standing next to the elevator that climbed Liris's cable. Margit and Selene were already on the platform, with a crowd of soldiers and several Liris prisoners including Moss and Odess.

He climbed aboard.

Margit smiled with supreme confidence. "This," she said as if to no one in particular, "is where we'll defeat her."

Venera looked down from her saddle at Guinevera, who stared at her with his bloody sword half raised. "You spoke out of turn, Principe," she called down. "Even if I wasn't Buridan before, I am now."

He ducked his head slightly, conceding the point. "We're grateful, Fanning," he said.

Venera finally let herself feel her triumph and relief, and slumped a bit in her saddle. Fragmentary memories of the past minutes came and went; who would have thought that the skin of Spyre would *bounce* under the gallop of a horse?

Scattered gunfire echoed around the corner of the building, but Sacrus's army was in full retreat. Their force below no-man's land had surrendered. No one had any stomach for fighting anyway; Sacrus and council soldiers stood side by side, exchanging uneasy glances as another long slow undulation moved through the ground. Council troops were swarming up the sides of Liris, but there was no sound from up there, and an ominous flag of smoke was fluttering from the roof line.

Seeing that, Venera's anxiety about her friends returned. Garth, Eilen, and Moss—what had become of them during Sacrus's brief occupation? Her eyes were drawn to the cable that stretched from Liris up to Lesser Spyre. It seemed oddly slack, and somehow that tiny detail filled her with more fear than anything else she'd seen today.

Closer at hand, she spotted Jacoby Sarto walking, unescorted, past ranks of huddling Sacrus prisoners. He looked up at her, his face eloquently expressing the unease she too felt.

Another undulation, stronger this time. She saw trees sway and a sharp *crack!* echoed from Liris's masonry wall. Some of the soldiers cried out.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Guinevera looked around. Ever the dramatist, his florid lips quivered as he said, "This should have been our moment of triumph. But what have we won? What have we done to Spyre?"

Venera did her best to look unimpressed, though she was worried too. "Look, there's no way to know," she said. That was a lie: she could feel it, they all could. Something was wrong.

A captain ran up. He saluted them both, but it was almost an afterthought. "Ma'am," he said to Venera. "It's . . . they're waiting for you. On the roof."

A cold feeling came over her. For just a second she remembered lying on the marble floor of the Rush admiralty, bleeding from the mouth and sure she would die there alone. And then, curled around herself inside Candesce, feeling the Sun of Suns come to life, minutes to go before she was burnt alive. She'd almost lost it all. She could lose it all now.

She flipped down the little ladder attached to her saddle and climbed down. Her thighs and lower back spasmed with pain, but there was no echo from her jaw. She wouldn't have cared if there had been. As a tremor ran through the earth, Jacoby Sarto reached to steady her. She looked him in the eye.

"If you come with me," she said, "whose side will you be on?"

He shrugged and staggered as the ground lurched again. "I don't think sides matter anymore," he said.

"Then come." They ran for the ladders.

21

All across Spyre, metal that had been without voice for a thousand years was groaning. The distant moan seemed half real to Venera, here at the world's edge where the roar of the wind was perpetual, but it was there. Spyre was waking, trembling, and dying. Everybody knew it.

She put one hand over the other and tried to focus on the rungs above her. She could see the peaked helmets of some of Guinevera's men up there and was pathetically glad that she wouldn't have to face this alone.

Sarto was climbing a ladder next to hers. Even a month ago, the very idea of trusting him would have seemed insane to her. And anyway, if she were some romantic heroine and this were the sort of story that would turn out well, it would be her lover Bryce offering to go into danger at her side—not a man who until recently she would have been perfectly happy to see skewered on a pike.

"Pfah," she said, and climbed out onto the roof.

Thick smoke crawled out of the broad square opening in the center of the roof. Ominous, it billowed up twenty feet and then was torn to ribbons by the world's-edge hurricanes. The smoke made an undulating tapestry behind Margit, her soldiers, and their hostages.

The elevator platform had been raised six feet. It was closely ringed by council troops whose weapons were aimed at Margit and her people. Venera recognized Garth Diamandis, Moss, and little Samson Odess among the captives. All had gun muzzles pressed against their cheeks.

A young woman in a uniform stood next to Margit. With Garth's face hovering just behind her own, Venera could be in no doubt as to who she was; she had the same high cheekbones and gray eyes as her father.

Her gaze was fixed on Margit, her face expressionless.

"Come closer, Venera," called Margit. She held a pistol and had propped her elbow on her hip, aiming it casually upward. "Don't be shy."

Venera cursed under her breath. Margit had managed to corral all of her friends—no, not all. Where was Eilen? She glanced around the roof, not seeing her among the other newly freed Lirisians. Maybe she was downstairs fighting the fires; that was probably it . . .

Her eye was drawn despite herself to a huddled figure lying on the roof. Freed

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of life, Eilen was difficult to recognize; her clothes were no longer clothes but some odd drapes of cloth covering a shape whose limbs weren't bent in any human pose. She stared straight up, her face a blank under the burnt wound in her forehead.

"Oh no . . ." Venera ran to her and knelt. She reached out, hesitated, then looked up at Margit.

Smoke roiled behind the former botanist of Liris. She smiled triumphantly. "Always wanted an excuse to do that," she said. "And I'd love an excuse to do the same to these." Her pistol waved at the prisoners behind her. "But that's not going to happen, is it? Because you're going to. . . ." She seemed to lose the thread of what she was saying, staring off into the distance for a few seconds. Then, starting, she looked at Venera again and said, "Going to give me the key to Candesce."

Venera glanced behind her. None of the army staff who knew about the key were here. Neither was Guinevera nor Pamela Anseratte. There was no one to prevent her from making such a deal.

Margit barked a surprised laugh. "Is this your solution? You thought to do a trade, did you?" Jacoby Sarto had stepped into view, paces behind Venera. Margit was sneering at him with undisguised contempt.

"That man-shaped *thing* might have been valuable once, but not anymore. It's not worth the least of these fools." She flipped up the pistol and fired; instantly hundreds of weapons rose across the roof, hammers cocking, men straining. Venera's heart was thudding painfully in her chest; she raised a hand, lowered it slowly. Gratefully, she saw the council soldiers obey her gesture and relax slightly.

She ventured a look behind her. Jacoby Sarto was staring down at a hole in the rooftop, right between his feet. His face was dark with anger, but his shoulders were slumped in defeat. He had nothing now, and he knew it.

"Your choice is clear, oh would-be queen of Candesce," shouted Margit over the shuddering of the wind. "You can keep your trophy, and maybe even use it again if you can evade us. Maybe these soldiers will follow you all the way to Candesce, though I doubt it. But go ahead: all you have to do is give the order and they'll fire. I'll be dead—and so will your friends. But you can walk away with your trinket.

"Or," she said with relish, "you can hand it to me now. Then I'll let your friends go—well, all save one, maybe. I need *some* guarantee that you won't have us shot on our way up to the docks. But I promise I'll let the last one go when we get there. Sacrus keeps its promises."

Venera played for time. "And who's going to use the key when you get to Candesce? Not you."

Margit shrugged. "They are wise, those that made me and healed me after you . . ." Her brows knit as though she were trying to remember something. "You . . . Those that made me—yes, those ones, not this one and his former cronies," she nodded to Sarto. "No, Sacrus underwent a . . . change of government . . . some weeks ago. People with a far better understanding of what the key represents, and who we might bargain with using it are in charge now. Their glory shall extend beyond merely cowing the principalities with some show of force from the Sun of Suns. The bargain they've struck . . . the forces they've struck it with . . . well, suffice it to say, Virga itself will be our toy when they're done."

An ugly suspicion was forming in Venera's mind. "Do these forces have a name? Maybe—Artificial Nature?"

Margit shrugged again, looking pleased. "A lady doesn't tell." Then her expression hardened. She extended her hand. "Hand it over. *Now*. We have a lot to do, and you're wasting my time."

The rooftop trembled under Venera's feet. Past the pall of smoke, Spyre itself

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

shimmered like a dissolving dream.

She'd almost had the power she needed, power to take revenge against the Pilot of Slipstream for the death of her husband. Enough wealth to set herself up somewhere in independence. Maybe she was even growing past the need for vengeance. It was possible she could have stayed here with her newfound friends, maybe in the mansion of Buridan in Lesser Spyre. Such possibilities had trembled just out of reach ever since her arrival among these baroque, ancient, and inward-turned people. It had all been within her grasp.

And Margit was right: she could still turn away. The key was hers and with it, untold power and riches if she chose to exercise it. True, she would have to move immediately to secure her own safety, else the council would try to take it from her. But she was sure she could do that, with Sarto's help and Bryce's. Maybe Spyre would survive, if they spun its rotation down in time and repaired it under lesser gravity. She could still have Buridan, her place on the council, and power. All she had to do was give up the prisoners who stood watching her now.

The Venera Fanning who had woken in Garth Diamandis's bed those scant weeks ago could have done that.

She reached slowly into her jacket and brought out the slim white wand that had caused so much grief—and doubtless would be the cause of much more. Step by step she closed the distance between herself and Margit's outstretched hand. Venera raised her hand and Margit leaned forward, but Venera would not look her in the eye.

Selene Diamandis put her foot in Margit's lower back and *pushed*.

As the former botanist sprawled onto Venera, bringing them both down, Selene pulled her own pistol and aimed it at the face of the man whose gun was touching Garth's ear. "Father, jump!" she cried.

Margit snarled and punched Venera in the chin. The explosion of pain was nothing compared to the spasms she usually got there so Venera didn't even blink. She grabbed Margit's wrist and the two rolled over and away from the platform.

"Lower your guns," Selene was shouting. Venera caught a confused glimpse of men and women stepping out of the way as she and Margit tumbled to the edge of the roof by the courtyard. Nobody moved to help her—if anyone laid a hand on either her or Margit, everyone would start shooting.

Margit elbowed Venera in the face and her head snapped back. She had an upside-down view of the courtyard below; it was an inferno.

"That red looks good on the trees, don't you think?" Margit muttered. She struck Venera again. Dazed, Venera couldn't recover fast enough and suddenly found Margit standing over her, pistol aimed at her.

"The key," she said, "or you die."

A shadow flickered from overhead. Margit glanced up, said, "What—" and then Moss collided with her and the two of them sailed off the roof. In the blink of an eye they were gone, disappearing silently into the smoke.

No one spoke. On her knees, gazing into the fire, Venera realized that she was waiting like everyone else for the end: a scream, a crash, or some other evidence that Margit and Moss had landed. It didn't come. There was only the dry crackle of the flames. Someone coughed and the spell was broken. Venera took a proffered arm and stood up.

It was Samson Odess who had helped her to her feet. A short distance away Garth Diamandis was hugging his daughter fiercely as the remaining Sacrus troops climbed down from the platform. The building was swaying, its stones cracking and grinding now. The whole landscape of Spyre was transforming as trees fell and buildings quivered on the verge of collapse. Soldiers and officers of both sides looked at one another in wonder and terror. Their al-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

liances suddenly didn't matter.

Odess pointed to the grandly spinning town-wheels miles overhead. "Come on," he said. "Lesser Spyre will survive when the world comes apart. It'll all fall away from the town-wheels."

Venera followed his gaze, then looked around. The little elevator platform might hold twelve or fifteen people; she could save her friends. Then what? Repeat the stand-off she'd just undergone, this time at the docks? Sacrus's leaders were there. They probably held the entire city by now.

"Who are you going to save, Samson?" she asked him. "These are your people now. You're the senior official in Liris—you're the new botanist now, do you understand? These people are your responsibility."

She saw the realization hit him, but the result wasn't what she might have expected. Samson seemed to stand a little taller. His eyes, which had always darted around nervously, were now steady. He walked over to where Eilen lay crumpled. Kneeling, he arranged her limbs and closed her eyes, so that it looked like she was sleeping with her cheek and the palm of one hand pressed against the stones of Liris. Then he looked up at Venera. "We have to save them all," he said.

It seemed hopeless, if the very fabric of Spyre was about to come apart around them. Even burying the dead in the thin earth of their ancestral home seemed pointless. In hours or minutes they would be emptied into the airs of Virga. The alternative for the living was to rise to the city, to probably become prisoners in Lesser Spyre.

The air . . .

"I know what to do," Venera said. "Gather all your people. We might just make it if we go now."

"Where?" he asked. "If the whole world's coming apart—"

"Fin," she shouted as she ran to the edge of the roof. "We have to get to Fin!"

* * *

She mounted her horse and led them at a walk. At first only a trickle of people followed, just those who had been on the rooftop, but soon soldiers of Liris and Sacrus threw down their weapons and joined the crowd. Their officers trailed them. Guinevera and Anseratte appeared, but they were silent when anyone asked them what to do.

As they passed the roundhouse Bryce emerged with some of his own followers. They fell into step next to Venera's horse but, while their eyes met, they exchanged no words. Both knew that their time together had ended, as certainly as Spyre's.

In the clear daylight, Venera was able to behold the intricacies of Greater Spyre's estates for the first and last time. Always before she had skulked past them at night or raced along the few awning-covered roads that were tolerated by this paranoid civilization. Now, astride a ten-foot-tall beast walking the narrow strip of no-man's land running between the walls, she could see it all. She was glad she had never known before what lay here.

The work of untold ages, of countless lives, had gone into the making of Spyre. There was not a square inch of it that was untouched by some lifetime of contemplation and planning. Any garden corner or low stone wall could tell a thousand tales of lovers who'd met there, children who built forts or cried alone, of petty disputes with neighbors settled there with blood or marriage. Time had never stopped in Spyre, but it had slowed like the sluggish blood of some fantastically old beast, and now for generations the people had lived nearly identical lives. Their hopes and dreams were channeled by the walls under which they walked—influenced by the same storybooks, paintings, and music as their ancestors—until they had become gray copies of their parents or grandparents. Each had added perhaps one small item to Spyre's vast stockpile of bric-a-brac, unknowingly placing one

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

more barrier before any thoughts of flight their own children might nurture. Strange languages never spoken by more than a dozen people thrived. Venera had been told how the lightless inner rooms of some estates had become bizarre shrines as beloved patriarchs died and because of tradition or fear no one could touch the body. More than one nation had died, too, as its own mausoleum ate it from the inside, its last inhabitants living out their lives in an ivy-strangled gatehouse without once stepping beyond the walls.

Now the staggered rows of hedge and wall were toppling. From the half-hidden buildings lurking beyond came the sound of glass shattering as pillars shifted. Doors unopened for centuries suddenly gaped revealing blackness or sights that seared themselves into memory but not the understanding—glimpses, as they were, of cultures and rituals gone so insular and self-referential as to be forever opaque to outsiders.

And now the people were visible, running outside as the ground quaked and the metal skin of Spyre groaned beneath them. They were like grubs ejected from a wasp's nest split by some indifferent boy; many lay thrashing on the ground, unable to cope with the strangeness of the greater world they had been thrown into. Others ran screaming, or tore at themselves or one another, or stood mutely, or laughed.

As a many-verandaed manor collapsed in on itself Venera caught a glimpse of the people still inside: the very old, parchment hands crossed over their laps as they sat unmoved beneath their collapsing ceilings; and the panicked who stood staring wide eyed at open fields where walls had been. The building's floors came down one atop the other, pancaking in a wallop of dust, and they were all gone.

"Liris's cable has snapped," someone said. Venera didn't look around. She felt strangely calm; after all, what lay ahead of them all but a return to the skies of Virga? She knew those skies, had flown in them many times. There, of course, lay the irony: for those who fell into the air with the cascading pieces of the great wheel, this would not be the end, but a beginning. Few, if any, could comprehend that. So she said nothing.

And for her? She had saved herself from her scheming sisters and her father's homicidal court by marrying a dashing admiral. In the end, he had lived up to her expectations, but he had also died. Venera had been taught exactly one way to deal with such crises, which was through vengeance. Now she patted the front of her jacket, where the key to Candesce nestled once again in its inner pocket. It was a useless trinket, she realized; nothing worthwhile had come of using it and nothing would.

For her, what was ending here was the luxury of being able to hide within herself. If she was to survive, she would have to begin to take other people's emotions seriously. Lacking power, she must accommodate.

Glancing affectionately at Garth, who was talking intensely with his red-uniformed daughter, Venera had to admit that the prospect wasn't so frightening as it used to be.

It became harder to walk as gravity began to vary between nearly nothing and something crushingly more than one *g*. Her horse balked, and Venera had to dismount; and when he ran off, she shrugged and fell into step next to Bryce and Sarto who were arguing politics to distract themselves. They paused to smile at her, then continued. Slowly, with many pauses and some panicked milling about as gaps appeared in the land ahead, they made their way to Fin.

They were nearly there when Buridan finally consigned itself to the air. The shouting and pointing made Venera lift her eyes from the splitting soil, and she was in time to see the black tower fold its spiderweb of girders around itself like a man spinning a robe over his shoulders. Then it lowered itself in state-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ly majesty through the gaping rent in the land until only blue sky remained.

She looked at Bryce. He shrugged. "They knew it might happen. I told them to scatter all the copies of the book and currency to the winds if they fell. They're to seed the skies of Virga with democracy. I hope that's a good enough task to keep them sane for the next few minutes, and then, maybe, they'll be able to see to their own safety."

The tower would quickly disintegrate as it arrowed through the skies. Its pieces would become missiles that might do vast harm to the houses and farms of the neighboring principalities; so much more so would be the larger shreds of Spyre itself when it all finally went. That was tragic, but the new citizens of Buridan, and the men and women of Bryce's organization, would soon find themselves gliding through a warm blue sky. They might kick their way from stone to tumbling stone and so make their way out of the wreckage. And then they would be like everyone else in the world: sunlit and free in an endless sky.

Venera smiled. Ahead she saw the doors of the low bunker that led to Fin, and broke into a run. "We're there!"

Her logic had been simple. Fin was a wing, aerodynamic like nothing else in Spyre. Of all the parts that might come loose and fall in the next little while, it was bound to travel fastest and farthest. So, it would almost certainly outrun the rest of the wreckage. And Venera had a hunch that Fin's inhabitants had given thought, over the centuries, about what they would do when Spyre died.

She was right. Although the guards at the door were initially reluctant to let in the mob, Corinne appeared and ordered them to stand down. As the motley collection of soldiers and citizens streamed down the steps, she turned to Venera and grinned, just a little hysterically. "We have parachutes," she said. "And the fin can be detached and let drop. It was always our plan of last resort if we ever got invaded. Now . . ." She shrugged.

"But do you have boats? Bikes? Any means of traveling once we're in the air?" Corinne grinned and nodded, and Venera let out a sigh of relief. She had led her people to the right place.

Spyre's final death agony began as the last were stumbling inside. Venera stood with Corinne, Bryce, and Sarto at the top of the stairs and watched a bright line start at the rim of the world, high up past the sedately spinning wheels of Lesser Spyre. The line became a visible split, its edges pulling in trees and buildings, and Spyre peeled apart from that point. Its ancient fusion engines had proven incapable of slowing it safely—it might have been the stress they generated as much as centripetal force that finally did in the titanium structure. The details didn't matter. All that Venera saw was a thousand ancient cultures ending in one stroke of burgeoning sunlight.

A trembling shockwave raced around the curve of the world. It was beautiful in the blued distance but Venera knew it was headed straight for her. She should go inside before it arrived. She didn't move.

Other splits appeared in the peeling halves of the world, and now the land simply shredded like paper. A roar like the howl of a furious god was approaching, and a tremble went through the ground as gravity failed for good.

Just before Bryce grabbed her wrist and hauled her inside, Venera saw a herd of Dali horses gallop with grace and courage off the rim of the world.

They would survive, she was sure. Kicking and neighing, they would sail through the skies of Virga until they landed in the lap of someone unsuspecting. Gravity would be found for them, somewhere; they were too mythic and beautiful to be left to die.

Corinne's men threw the levers that detached Fin from the rest of Spyre. Suddenly weightless, Venera hovered in the open doorway and watched a wall of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

speed-ivy recede very quickly, and disappear behind a cloud.

Nobody spoke as she drifted inside. Hollow-eyed men and women glanced at one another, all crowded together in the thin antechamber of the tiny nation. They were all refugees now; it was clear from their faces that they expected some terrible fate to befall them, perhaps within the next few minutes. None could imagine what that might be, of course, and seeing that confusion, Venera didn't know whether to laugh or cry for them.

"Relax," she said to a weeping woman. "This is a time to hope, not to despair. You'll like where we're going."

Silence. Then somebody said, "And where is that?"

Somebody else said, "Home."

Venera looked over, puzzled. The voice hadn't been familiar, but the accent . . .

A man was looking back at her steadily. He held one of Fin's metal stanchions with one hand but otherwise looked quite comfortable in freefall. She did recognize the rags he was wearing, though—they marked him as one of the prisoners she had liberated from the Gray Infirmary.

"You're not from here," she said.

He grinned. "And you're not Amandera Thrace-Guiles," he said. "You're the admiral's wife."

A shock went through her. "What?"

"I only saw you from a distance when they rescued us," said the man. "And then lost sight of you when we got here to Fin. Everyone was talking about the mysterious lady of Buridan. But now I see you up close, I know you."

"Your accent," she said. "It's *Slipstream.*"

He nodded. "I was part of the expedition, ma'am—aboard the *Arrest*. I was there for the big battle, when we defeated Falcon Formation. When your husband defeated them. I saw him plunge the *Rook* into the enemy's dreadnought like a knife into another man's heart. Had time to watch the bastard blow up, before they netted me out of the air and threw me into prison." He grimaced in anger.

Venera's heart was in her throat. "You saw . . . Chaison die?"

"Die?" The ex-airman looked at her incredulously. *"Die?* He's not dead. I spent two weeks in the same cell with him before Falcon traded me to Sacrus like a sack of grain."

Venera's vision grayed and she would have fallen over had she been under gravity. Oblivious, the other continued: "I might'a wished he were dead a couple times over those weeks. It's hard sharing your space with another man, particularly one you've respected. You come to see all his faults."

Venera recovered enough to croak, "Yes, I know how he can be." Then she turned away to hide her tears.

The giant metal wing shuddered as it knifed through the air. Past the opened doorway, where Bryce and Sarto were silhouetted, the sky seemed to be boiling. Cloud and air were being torn by the shattering of a world. The sound of it finally caught up with Fin, a cacophony like a belfry being blown up that went on and on. It was a knell that should warn the principalities in time for them to mount some sort of emergency response. Nothing could be done, though, if square miles of metal skin were to plow into a town-wheel somewhere.

To Venera, the churning air and the noise of it all seemed to originate in her own heart. He was alive! Absurdly, the image came to her of how she would tell him this story—tell him about Garth rescuing her, about her first impressions of Spyre as seen from a roofless crumbling cube of stone, about Lesser Spyre and Sacrus and Buridan tower. Moments ago they had been mere facts, memories of a confused and drifting time. With the possibility that she could tell him about them, they suddenly became episodes of a great drama, a rousing tale she

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

would laugh and cry to tell.

She turned to Garth, grinning wildly. "Did you hear that? He's alive!"

Garth smiled weakly.

Venera shook him by the shoulders. "Don't you understand? There is a place for you, for all of you, if you've the courage to get there. Come with me. Come to Slipstream, and on to Falcon, where he's imprisoned. We'll free him and then you'll have a home again. I swear it."

He didn't move, just kept his grip on his daughter while the wind whistled through Fin and the rest of the refugees looked from him to Venera and back again.

"Well, what are you scared of?" she demanded. "Are you afraid I can't do what I say?"

Now Garth smiled ruefully and shook his head. "No, Venera," he said. "I'm afraid that you can."

She laughed and went to the door. Bracing her hands and feet on the cold metal she looked out. The gray turbulence of Spyre's destruction was fading with the distance. In its place was endless blue.

"You'll see," she said into the rushing air. "It'll all work out.

"I'll make sure of it." ■

IN TIMES TO COME

Could our scientific revolution have happened three hundred years earlier than it did? In our July/August Double Issue, Michael F. Flynn looks at that question from two different angles and comes to conclusions that may surprise you. Once again we have the unusual phenomenon of a single author providing both a fact article and a related story in the same issue. The titles are both in Latin, but don't let that fool you; both pieces are most definitely in English, albeit unusual in style. The fact article, "De Revolutione Scientiarium in Media Tempestas," is appropriately written in the kind of debate format popular among scholars of the time it examines, and the novelette, "Quaestiones Super Caelo et Mundo," conveys a vivid feel for the medieval atmosphere and just how exciting discoveries we now take for granted would have been back then.

We'll also have quite a variety of other fiction, including the penultimate story in C. Sanford Lowe and G. David Nordley's Black Hole Project series, the ultimate (perhaps) Bubba Pritchert story by Bud Webster, a new tale of Amy Bechtel's sea monsters, and several totally new items by such writers as Joe Schembrie, Richard A. Lovett, and John G. Hemry. It all adds up to a really special midyear special.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE REFERENCE LIBRARY Tom Easton

The Silver Ship and the Sea, Brenda Cooper, Tor, $25.95, 396 pp. (ISBN: 0-765-31597-1).

Antagonist, Gordon R. Dickson and David W. Wixon, Tor, $27.95, 429 pp. (ISBN: 0-312-85388-2).

Mappa Mundi, Justina Robson, Pyr, $15.00, 514 pp. (ISBN: 1-59102-491-9).

Summer of the Apocalypse, James Van Pelt, Fairwood Press, $17.99, 259 pp. (ISBN: 0-9746573-8-7).

Starship: Pirate, Mike Resnick, Pyr, $25.00, 344 pp. (ISBN: 1-59102-490-0).

Measuring the World, Daniel Kehlmann, transl. Carol Brown Janeway, Pantheon, $23.00, 263 pp. (ISBN: 0-375-42446-6).

The Sam Gunn Omnibus, Ben Bova, Tor, $29.95, 704 pp. (ISBN: 0-765-31617-X).

Among the classic tropes of SF are space travel, space colonies, *Homo superior* (mutant or genetically engineered replacements for standard-issue humanity; a.k.a. slans), insistence of standard-issue humans on maintaining their purity, and mental powers. The classic slan story is one of difference, rejection, and the struggle to find a niche into which one can fit more or less comfortably. Set it in a space colony, with the rest of those tropes, and you have Brenda Cooper's **The Silver Ship and the Sea**.

There's more to it, of course. The world is Fremont, to which standard-issue humans came in search of a place where they could be free of domination (and pressure to change) by the *altered*, those who had embraced genetic engineering as a fount of enhancements of many kinds, both physical and mental. They had just barely established their colony when two shiploads of *altered* arrived, and before long there was war. The *altered* had more advanced weaponry as well as modifications for strength, speed, sensory acuteness, and more, but they were outnumbered. A few fled in one of their ships, leaving one ship, the *New Making*, aground, one adult, Jenna, missing an arm and an eye and lurking in the wilderness, and six very young children whom the colonists could not bring themselves to destroy. Chelo and Joseph were taken in by the colony's leaders. Liam, Alicia, Bryan, and Kayleen were taken in by others. Some were treated properly, as adopted children. Some—notably Alicia—were not, for there remained a powerful awareness that these kids were different, they had powers, and their parents, their kind, were dangerous.

As the kids grow up, their powers develop and prove useful. Joseph, for instance, can sense data flows and is invaluable for maintaining the sensor network that helps the colony know when bad weather is coming or predators are on the move. There are taunts from "normal" kids, but life is tolerable. But then an earthquake kills Chelo's and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Joseph's adoptive parents. Joseph is linked to the data net when it happens; the emotional blow leaves him incapable of using his power. New leaders take over, even moving into their home to take charge, and they are much less sympathetic. In fact, since the data nets are down as a result of the quake and Joseph can't fix them, his inability gets treated as a refusal.

The two Roamer bands come into town to trade. The west band has Liam, where he is treated as the leader's heir apparent. The east band has Alicia, who is all but kept in a cage. When that becomes apparent, the kids discover that they do not have the rights other kids do. They are *not* budding citizens; they are still what they were years ago, prisoners of war. They are supposed to take orders and say "Thankee, Massah" for whatever they are given.

Enter Jenna, who gives the kids a bit of help and encouragement and tells them something of their heritage. Joseph's powers grow with astonishing speed, to the point where the colonists are terrified. Chelo, who seems something of a born leader (and considering her ancestry, that just may be more than a metaphor), must struggle to reconcile the pressures and give everyone what they want, which just may involve finding a way into that locked-up spaceship at the spaceport.

The kids are on the cusp of puberty. In some writers' hands, that could mean a rather raunchy tale. In Cooper's hands, there are budding relationships and romantic tensions, but nothing more. The tale is thus suitable for school libraries and other venues whose gatekeepers want good stories that won't get blue noses out of joint. Not that it's a "young adult" novel. The relationships and issues are more than intricate enough to satisfy more mature readers. But the protagonists are young, and the themes are ones that must necessarily speak to young adult readers.

Enjoy.

* * *

Many years ago, the late Gordon R. Dickson embarked on his "Childe Cycle," a planned set of historical, present-day, and science fiction novels about the conflict between two opposing halves of the human species, the Responsible Man (and Woman), the far-sighted rationalist who works for the good of humanity as a whole, and the Selfish Man, the short-sighted rationalizer who works solely for his own gratification. He had fragmented the human character into three of its prime modes, reason, faith, and intuition, and given each its own world or worlds, that of the strategically and tactically adept Dorsai, those of the religious-fundamentalist Friendlies, and those of the mystical Exotics. His novels had worked toward bringing the three together in a unified, higher variety of human being in the form of hero Hal Mayne, who was once Donal Graeme of the Dorsai. Yet he recognized that the two halves he saw could be further divided. Hal Mayne's opponent was Bleys Ahrens, one of that group called the Others, mostly hybrids (*e.g.*, Exotic-Friendly); Bleys thought the species' future was best served by withdrawing to Old Earth, whose people are famous for their chaotic diversity, abandoning the colonies, and taking whatever time was needed for the species to grow up. Hal's vision was more expansive.

Bleys' tale was told in *Young Bleys* (reviewed here in September 1991) and *Other* (March 1995). Now David W. Wixon, working from Dickson's notes, has completed the third volume, **Antagonist**, in which Bleys' shortcomings become clear as he grows to see that only war will serve his purpose. He cares for his dream more than for the people around him, much less those at further remove, and he readily manipulates them all in furthering his plots and schemes. He is clearly a destroyer, where Hal is a builder.

The novel begins with Bleys trapped in a bunker while unnamed foes close

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

in. Flashbacks reveal how he got there, strengthening his political position by visiting Friendly mercenaries on Ceta. Soon he is aware of a competing conspiracy, working to weaken the worlds of the Dorsai and the Exotics. When he gains their cooperation by helping them, his cause seems strengthened. The momentum for war builds. But Hal Mayne is always one step ahead, until finally they are nose-to-nose across a line in the sand, and Hal is saying, "We will prevail."

But even though Bleys' plans have been inverted in more than one way, who will prevail is by no means certain. If Dickson had lived, he would surely have planned another book. If *Antagonist* succeeds in the market, Wixon may do the same. But *Antagonist* suffers from the same flaws as its predecessors of the 1990s. It is wordy and didactic, even preachy, and characters are too thin to be convincing. Nor does the pacing seem real, for the colonies' readiness for war leaps forward with no more preparation than a wave of the auctorial wand. Bleys faces far too little resistance for a reader accustomed to modern politics to believe.

SPOILER WARNING: I said Bleys' plans wind up inverted, which is a pretty cryptic statement. Recall that Bleys is helping to destroy the Dorsai and the Exotics and that he wants to move the people of the colonies back to Old Earth. The line in the sand is a barrier around Earth, with Earth and the Dorsai and Exotics on one side, and Bleys and the Friendlies on the other. If Earth is the pot in which humanity grows up, the recipe is for adding reason and intuition to chaotic diversity. Bleys' preference would have been for adding religious fervor to that diversity. Sound familiar?

Science fiction has long loved such notions as matterporting, where the basic idea is to scan something such as a human being, generate a corresponding signal, send the signal, and then reassemble the scannee, perhaps light-years away. As a notion, it doesn't really matter whether the scanning uses matter-to-energy conversion or nanotechnological disassemblers. The point is the signal, which of course can be recorded and edited. So there have been stories about doppelgangers and mind control.

The latter is particularly frightening. It presupposes an extraordinarily intimate understanding of how the mind works at both the software and hardware levels, but given that, it is no great leap to think of editing beliefs and loyalties (not to mention what it could do for education!). And you wouldn't need matterporting to do the editing with. An injection (or infection) of nanobeasties would be enough to do the trick, and we've seen those stories too.

Yet though the technology could be used for evil, there are also great possibilities for healing, for freeing people of their slavery to ideology, for helping people be the best they can be. If and when such technology is developed, what will it be used for? This is the question Justina Robson addresses in **Mappa Mundi**, which begins (after a set of introductions of main characters which seems to serve no real purpose except to establish the author's credentials as a "character-oriented" writer) when a small town next to a Native American reservation suffers an attack of madness. White Horse, whose brother Jude is a government agent who hunts down illicit "Perfectionist" technology (such as genetic engineering), escapes an arsonist mob with the strange device she had stolen from a car still in her possession. Now meet Natalie Armstrong, who is involved in the development of NervePath nanotech, which explores neural interconnections in the brain, and Mappa Mundi, which aims to build a brain map that can be tweaked to—in Natalie's clinic—heal brain damage such as that of Patient X, who fell off a roof. She has

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

also been trying to get funding to develop her own variant, Selfware, which should boost personal potential. She is dodging calls from someone named Jude.

Things get strange when Natalie's crew finally tries their cure on Patient X, for someone has hacked the software. Now he has Selfware, and though his brain is clearly repaired, he goes transparent and vanishes. But not before passing through Natalie and activating her own internal gadgetry.

Meanwhile it is becoming clear that there are far too many schemes and conspiracies to keep straight. The US government is trying hard to get its hands on the Mappa Mundi technology first, so it can—of course—ensure that peace, democracy, and the American Way dominate the world. Or so says one faction; others have more sinister aims. The Russian genius who has been Jude's target for years turns out to have a host of identities, including that of the moving force behind Mappa Mundi, and his agenda is something quite different. As Natalie and Jude figure out what is at stake, they must face decisions. What can they do? What should they do? Is it even possible to save the world? And here comes Patient X again, a genuine *deus ex machina*, to help them reach a more or less satisfactory resolution.

The book is interesting, but ultimately quite bleak, especially for a reader who cannot accept the transcendence represented by the *deus*. Nor is the final epilog or "Update" much help, for it hints at a world where Mappa Mundi has become blinders as effective at enforcing ignorance of the real world as any ideology. No "solution," says Robson, works forever. Indeed, says her Russian genius, his Memetic Calculus proves that. No matter what is done with Mappa Mundi, it is only a matter of time before the *status quo ante* returns. *Plus ca change, plus c'est la meme chose.*

You may recall James Van Pelt's short work from these (and other magazine) pages. His collections have won praise as fine fare for young adults. His first novel is **Summer of the Apocalypse**, a rather gentle, warm, and symmetrical tale of life after a plague nearly wiped out the human species.

Meet Eric. He's 75, one of the last survivors of the Gone Times. He lives with a few hundred others in Littleton, Colorado, and tries to sell the idea that literacy matters, that regaining the lost knowledge and technology should be seen as just as important as scavenging another shirt or knife from the ruins of the past. His son Troy scorns all that guff. The important things are planting and reaping, marrying and burying, day to day life, not the future. But Eric knows that the miscarriage rate is high, and if no one minds the future, the future will have no place in it for them. Fortunately, his grandson Dodge and his skittish friend Rabbit seem more interested in learning to read and listening to Grandpa's tales. And when, after one more argument with Troy, Eric decides to set out on one last trek, perhaps all the way to the University to see if its books are still there, they follow him. And when he finally spots them, they become his companions.

For the symmetry, Van Pelt has Eric recall his own youth. He was just fifteen when the plague struck, and his own father took his wife and son into the hills, where he had already stocked a cave with supplies. But the plague is relentless, and soon Eric is left alone to witness the collapse of civilization in flame, chaos, and several kinds of barbarism. Despite the horror of the collapse, however, the dominant mood is a very sad melancholy, underlined by a cop who struggles to do his job, an ex-nurse who hopes desperately that capturing healthy survivors and taking their blood can save her and her lover, Eric's own determination to return to his suburban house and find there his missing dad, and the patience with his obsession

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

shown by Leda, an older woman who will in due time become Troy's mother.

In the contemporary tale, Eric, Dodge, and Rabbit trek onward. Eric's strength isn't what it used to be, so progress is slow. But he is game, and when they meet a band of people who sneer at "jackals," scavengers like they and their people, Van Pelt brings into focus an important question: In the wake of disaster, should people scavenge for survival, or should they strike out anew? Live in the past, or the present? Or perhaps, he says a little later when he brings in still another group, should people plan for the future?

The father-son thing is strong here. Eric and his dad. Eric and Troy. Troy and Dodge. The generational tension is clear, and so is Van Pelt's thought that the tension cannot be resolved without remembering the past in the present and passing it to the future. "Everything circled around."

Is this one, like the Van Pelt collections, fare for young adults? I called it "gentle," so it would certainly fit that market segment, but it is not kid stuff. Give it a try. I think you'll enjoy it.

Mike Resnick's **Starship: Pirate** follows *Starship: Mutiny* as space opera in the classic vein, but with plenty of touches of pure Resnick. The earlier book introduced Wilson Cole as first officer aboard the *Theodore Roosevelt*, a superannuated warship staffed by misfits and screwups. Cole got there by embarrassing the brass by being right too many times, and he soon did it again. In the process he earned the crew's loyalty, and when he was court-martialed for his sins, they busted him out of jail. They then stole the *Teddy* and it was heigh-ho for the Jolly Roger.

But Cole is one of the good guys. If he's going to be a pirate, who should he prey upon? There's only one real choice—the bad guys, meaning other pirates—and soon they have a very nice haul in their hands. Alas, the fence they find—an alien named David Copperfield who is quite enchanted to find that Cole knows his Dickens—isn't about to give them any sort of reasonable price. It seems that piracy, like any trade, requires learning. Before long, Cole has found the beautiful and deadly Valkyrie, a Pirate Queen who has lost her ship, needs help getting it back, and is willing to coach Cole along in return for that help.

More problems ensue, and though Cole is more than competent at dealing with them, there remains the fate of the *Teddy*'s erstwhile owners who given the chance would blow it and all its crew to space dust. The eventual solution . . . Suffice it to say that the titles of the books remaining in the series—*Mercenary, Rebel,* and *Flagship*—seem designed to sketch Cole's future path.

Few writers have Resnick's gift for pace and momentum, nor his talent for producing a fast, smooth, utterly effortless read. This one's light, to be sure, but you'll enjoy it.

German author Daniel Kehlmann is a phenomenon. According to the press release that accompanied **Measuring the World**, the book has sold more than 600,000 copies in Germany and knocked Harry Potter and *The DaVinci Code* off the bestseller list. Foreign rights have sold to 32 countries, and all that's missing is a contract with Hollywood.

Who knows? Maybe that will come, for the film *A Beautiful Mind*, about mathematician John Nash, was a success, and *Measuring the World* features not one but two—count 'em!—eccentric geniuses. The first is mathematician Carl Gauss, who could jump out of bed on his wedding night to jot down a formula; from time to time Gauss worked as a surveyor, literally measuring the world. The second is geographer Alexander von Humboldt, who explored South America, climbing mountains, sending back to Europe shiploads

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of specimens, and constructing maps, thus also fitting the book's title. Both men were driven and arrogant. Gauss in particular was contemptuous of those around him, who thought more slowly and less deeply. Humboldt was impatient with delay and human weakness, including his own, and invented a breathing apparatus so he could go deeper into mines and caves.

Kehlmann tracks their lives and careers, showing how they created difficulties for themselves and those around them, before bringing them together, both full of honors, in 1828 for a journey across Russia, during which their attention is monopolized by meet-and-greets while various hangers-on and assistants usurp all the scientific work for which they had lived. The overall tone of the book, despite a wealth of wit and irony, is thus quite sad. The theme is the struggle to control one's destiny and how, after success, it escapes once more. And then, well . . . Gauss's son Eugen, fallen afoul of the secret police, has been exiled. As the book ends, his ship is approaching the coast of the New World, where the struggle will be renewed.

Kehlmann, at least in translation and I presume in the original, is an assured and skillful writer who deserves the acclaim he has received. You could do much worse for yourself than to pick up a copy.

The first of Ben Bova's Sam Gunn stories appeared many years ago, and they're still coming. If you've enjoyed them, you want to get **The Sam Gunn Omnibus**, which collects them all, puts them in chronological order (though Bova says "It isn't easy to put all the tales . . . in any sequence that even vaguely resembles chronological order," and adds enough new ones to get the total count up to fifty. Unfortunately there is no listing of where and when all the tales first appeared, so you won't find it easy to tell whether a tale is new or you just missed it before.

Did you miss them all? Well, Sam Gunn is a quintessential scalawag, con man, and letch. No scruples at all. But he is also a hero bent on justice in his uniquely twisted way. He can sue the Pope, rescue girls in a sex-trade jam, and finagle investors into making the space program boom, all while having fun himself and making the reader smile till it hurts. ■

VISIT OUR WEBSITE
www.analogsf.com

Don't miss out on our lively forum, stimulating chats, controversial and informative articles, and classic stories.

Log on today!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

BRASS TACKS

Mr. Schmidt:

This, with reference and in response to your January/February 2007 *Analog* editorial, "The Cheesesteak Nazi, etc."

You make a good point, but appear not to notice in your fervent pursuit of declaiming individual rights to choose (and, I hope, make such choice as an informed citizen) to have missed the fork in the road that may lead to considering the validity, nay, necessity of imposing requirements on those who provide for sale things about which those decisions must be made: food, in particular, but I would extend the list well beyond the making of gustatory choices that we must make several times a day, to include other, non-food consumer items, as well.

". . . People have the right to decide for themselves what to do with their own bodies—if they also accept . . . And that is something that our current culture has aggressively discouraged, to the point of making it practically impossible."

Oh, so true, that part about our culture making it virtually impossible to make such decisions! But, it seems that your course is rather to decry imposing controls on the supply side, to the detriment of what could be a balanced argument in the article.

The fork in the road (no pun intended) is this: the purveyors of food containing transfats do not typically provide information that allows one to make an informed decision that would allow one to pursue an obviously available recourse to "going elsewhere" to obtain a meal. This has changed a little since the suit to which you make reference was filed—probably, in great measure, as a consequence of the fact that the suit was filed!

Here is a question for you: When did you see the fried chicken chain to which you make reference advertising that they served chicken cooked with transfats and that those transfats might be detrimental to the health of the consumer and if you (the potential consumer of their faire) prefer to obtain a more healthy alternative, you should consider dining elsewhere?

Have you ever known of any purveyor of food to provide detailed recipes of their dishes for perusal by customers so they can make their informed decisions?

Case in point, the restaurant that had peanut butter as a "secret ingredient" in their chili and, as a result, one of the customers with an allergy to peanuts died after eating their chili. Could that customer have made an all-important informed decision? The answer is obviously "no." Would anyone even suspect that peanut butter were one of the conceivable ingredients of chili? Not I! That one hit me in the side of the head—but, then, I am not a chef.

Yes, we should allow people to decide for themselves, but we must give them the tools they need to make such decisions intelligently, even if we have doubts that the majority of the population is fully competent to make intelligent decisions. Still, we have an obligation to make the effort.

I don't really want to get into an attempt to address smoking—though you mention it in your article. But it serves as a prime and "in your face" example of the provider of a commodity making every effort to avoid disclosure of essen-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tial information that would have helped at least one reasonably intelligent individual to make a decision not to take a course of action leading to emphysema, cancer, or a multitude of other drastic consequences that could have been avoided, had the apparently well-documented information, available to insiders for years, not been hidden.

Enough of this, for me. Thank you for taking the time to read and consider my comments. I wish you the best. I should mention that I have found much pleasure in reading *Analog* and anticipate many more years of doing the same.

David Marciel

Actually, many restaurants do make such information available on request, or by looking at a poster on the wall. Even if they don't, though, people who care can also take responsibility for learning about the general nutritional content of types of food, and asking about things that particularly concern them. People who know they have allergies can and should take it upon themselves to ask, when ordering anything, whether it contains their particular allergen. Those with uncommon allergies have to do this, and I'm not yet convinced that it's reasonable to expect everyone selling food to list everything it contains that might conceivably be a problem for somebody.

Dear Stan,

I am writing to Jeffery Kooistra in regard to his Alternative View column "Imagination" in the January/February edition of *Analog*. Mr. Kooistra, I have generally enjoyed seeing your column as a counterpoint to other views, though I would not say that I have often agreed with everything you say. This time I take particular exception to many of your arguments and the general tenor of the piece. I believe you have fallen into the same error that you have often accused others of, namely criticizing things without checking facts. Your criticism of Ms. Kelley's article is awkward and demeaning. You basically said that she is imagining the motivation of many of the folks that overstay their visas. In fact, this is borne out by interviews that I have heard with some of these unfortunate folks. Often they are trying to finish getting their degrees at an American university. The situation has been exacerbated by our own government's policies, particularly with regard to the Middle East, by refusing to allow people back into the country after visits abroad and refusing to extend visas. Perhaps you should listen to some of their stories yourself before you go off and berate others who have checked out some facts. Just who has some mystic process here? I would also say that it is not too much of a stretch of my imagination to be concerned about a government which has at least a couple of leaders who instituted torture as a policy and are likely to be charged with war crimes by the international community at some time in the future.

Your praise of racial/ethnic profiling is also very disturbing. Rounding up people based on these factors alone is another indication of totalitarian abuse..Do I even need to mention Nazi Germany in this regard? Many other such regimes in current times do the same, e.g. some of those in Latin America, Africa, and Indonesia. Profiling is a poor law enforcement policy because it angers the entire group that is targeted and makes a bad situation worse. I would like to hear from some law enforcement folks what they think of the effectiveness of profiling. Yes, the 9-11 attack was horrendous, but so was the Oklahoma bombing and the long list of other bombings and killings by white extremists, e.g. Timothy McVeigh, Ted Kaczynski, David Lane, Michael Griffin, et al. Following your logic, we should really be rounding up white males since they are much more likely to be terrorists than men from the Mid East. My imagination is not so extreme that I can imagine this hap-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

pening in this country. Being a white male, I know I would not care to be pulled from my car just because of my race and gender. Would you? By the way, do you have any evidence whatsoever that white males were ever rounded up en masse in this country as suspects in a KKK lynching? I do not recall an event like this.

Finally, I am dismayed by the use of imagination to create and promote fear and paranoia, which seems to underlie your main points. Certainly, many politicians in recent times have used this tactic to further their own power and create a disturbing climate of fear and hate in our country. Given your past articles I have read, I doubt that this was your intent, but it sure comes off that way.

Ron Pehmoeller
Largo, FL

The author responds . . .

In her piece, Ms. Kelly mentioned two high-profile senators, Patrick Leahy (D-Conn.) and Russ Feingold (D-Mich.). Had I wished to demean her, I would have pointed out that she got the home states of both senators wrong, and argued that the rest of her article wasn't worth reading since, obviously, attention to detail and simple matters of fact isn't her strong suit. I didn't do this because the bulk of her article did have merit, and her failure to fact check on those senators' home states was irrelevant to the points she wanted to make.

However, I do think that lapse on her part suggests that at points she was writing more from her heart than from her head, but that's just my opinion. I mention it here because I think you're doing the same thing.

It bothers you that I said Ms. Kelly "is imagining the motivation of many of the folks that overstay their visas." Why? That is exactly what she's doing. No doubt some of them are guilty of no more than overstaying their visas—perhaps most of them are. But perhaps some of them are here for other reasons, even *bad* reasons. The only way to know is to take them in for questioning and then figure out if their answers are truthful or not. This means sometimes people are scooped up who should not have been. Oh well. Police work is messy and life isn't fair. Deal with it.

I did not praise racial/ethnic profiling. Used by itself or used unwisely, or with no common sense about it, it can do more harm than good. It is definitely a sledgehammer sort of approach. But when a sledgehammer is needed or it is all you've got, then you're stuck with it. And why is it that folks with your apparent mindset always think they have to bring up Nazi Germany like no one else has ever heard of it? Making note of the fact that all of the nineteen 9-11 terrorists were middle-eastern and taking that into account when looking for additional threats does not mean the next step is death camps.

Would I like being pulled from my car just because I'm a white male? Hell no! But I also wouldn't like it if I was guilty of drunk driving, and I do think the police should profile drivers who are swerving back and forth across the road. And if you would read more carefully, you will note that I never said KKK members were ever rounded up en masse. I said, "white males are the suspects." Indeed, my guess is that many times white male KKK members should have been rounded up but were not.

Finally, this is too ironic to pass up. You say you are "dismayed by the use of imagination to create and promote fear and paranoia." Yet it is you and Ms. Kelly who are raising the specter of the Nazis and the STASI and the Big Brother future.

I repeat what I said at the end of my article: We can't let our imaginations get carried away by too much worrying about what might happen when we need to sharpen our imaginations to deal with what already *is* happening.

Jeffery D. Kooistra ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

CLASSIFIED MARKETPLACE

Advertise in the world's leading science fiction magazines with our Analog/Asimov's combined classified section. Ad rates per issue: $2.95 per word (10 word minimum), $125 per column inch (2.25 inch maximum). SPECIAL INTRODUCTORY OFFER: Buy two ads and receive a third ad FREE. Send orders to: Dell Magazines, Classified Department, 475 Park Ave. S., 11th Floor, New York, NY 10016. Direct inquires to: (212) 686-7188; Fax (212) 686-7414 or email: adsales@dellmagazines.com

BOOKS/PUBLICATIONS

BUYING SCIENCE FICTION magazines,book collections. Will travel for large accumulations. Bowman, Box 167, Carmel, IN 46082.

ENEMY MINE, All books in print, Check: www.barrylongyear.net

June 2508 (www.June2508.com $14.95). Savor the subtle aspects of longevity, intelligence, religions, toolboxes, driving cars, sex-toys, first aliens... in an action-romance story, spanning the Computer and DNA Ages, with a few of Asimov's "Seldon crises" of its own. Enjoy it here and/or watch it all unfold over the next five centuries!

BOOKS/PUBLICATIONS

PUBLISH YOUR BOOK ONLINE, Third Millennium Publishing, a cooperative of online writers and resources, http://3mpub.com

EGOG! BLAGH! Take a look at our mag! It's at http://surprisingstories.dcwi.com

ANALOG SCIENCE FICTION AND FACT
Classified Department 475 Park Ave South, 11th Floor New York, NY 10016
Call: (212) 686-7188 Fax: (212) 686-7414 adsales@dellmagazines.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

UPCOMING EVENTS Anthony Lewis

17–21 May 2007
PHOENIX RISING (New Orleans Harry Potter conference) at Sheraton New Orleans Hotel, New Orleans, LA. Guests of Honor: Henry Jenkins, Jon Burlingame, Danny Bilson, Anne Hiebert Alton, Victoria Dann. Registration: $180 until 10 April 2007, $200 at the door. Info: www.thephoenixrises.org; help@thephoenixrises.org; P.O. Box 27642 Denver, CO 80227-0642.

25–27 May 2007
OASIS 20 (Central Florida SF conference) at International Plaza Resort, Orlando, FL. Guests of Honor: Larry Niven, Joe Haldeman, Michael Bishop, Mike Resnick, Jack McDevitt, Kathleen Ann Goonan, Robert J Sawyer, Linda Evans, Bruce Boston. Registration: $30 until 30 April 2007, $35 at the door. Info: www.oasfis.org; sacole@mindspring.com.

25–28 May 2007
BALTICON 41 (Baltimore area SF conference) at Marriott's Hunt Valley Inn, Baltimore MD. Guests of Honor: Larry Niven & Jerry Pournelle. Artist Guest of Honor: Joe Bergeron. Fan Guests of Honor: Jeff & Maya Bohnhoff. Registration: $50 until 30 April 2007, $58 at the door. Info: www.balticon.org; balticoninfo@balticon.org.

25–28 May 2007
BAYCON (San Mateo area SF conference) at San Mateo Marriott, San Mateo, CA. Guests of Honor: Alan Dean Foster, Diana L. Paxson, Richard Hescox, Linda "Kitty" VonBraskat-Crowe. TM: Seanan McGuire. Registration: $65 until 30 April 2007, $75 until 15 May 2007 and at the door. Info: www.baycon.org.

1–3 June 2007
CONCAROLINAS 2007 (Carolina area SF conference) at Marriott Executive Park, Charlotte NC. Guests of Honor: Barbara Hambly. Elaine Cunningham, Teri Wachowiak, Robert Buettner. Info: www.concarolinas.org; concarolinas@concarolinas.org; ConCarolinas, Box 9100, Charlotte NC 28299-9100.

30 August–3 September 2007
NIPPON 2007 (65th World Science Fiction Convention) at Pacifico Yokohama, Yokohama, Japan. Guests of Honor: Sakyo Komatsu and David Brin. Artist Guests of Honor: Yoshitaka Amano and Michael Whelan. Fan Guest of Honor: Takumi Shibano. Registration: USD 220; JPY 26,000; GBP 125; EUR 186 until 30 June 2007; supporting membership USD 50; JPY 6,000; GBP 28; EUR 45. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Nominate and vote for the Hugos. This is only the third time Worldcon will be held in a non-English speaking country and the first time in Asia. Info: www.nippon2007.org; info@nippon2007.org. Nippon 2007/JASFIC, 4-20-5-604, Mure, Mitaka, Tokyo 181-0002. North American agent: Peggy Rae Sapienza, Nippon 2007, PO Box 314, Annapolis Junction, MD 20701, USA. UK agent: Andrew A. Adams, 23 Ivydene Road, Reading RG30 1HT, England, U.K. European agent: Vincent Doherty, Koninginnegracht 75a, 2514A Den Haag, Netherlands. Australian agent: Craig Macbride, Box 274, World Trade Centre, Victoria, 8005 Australia. ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

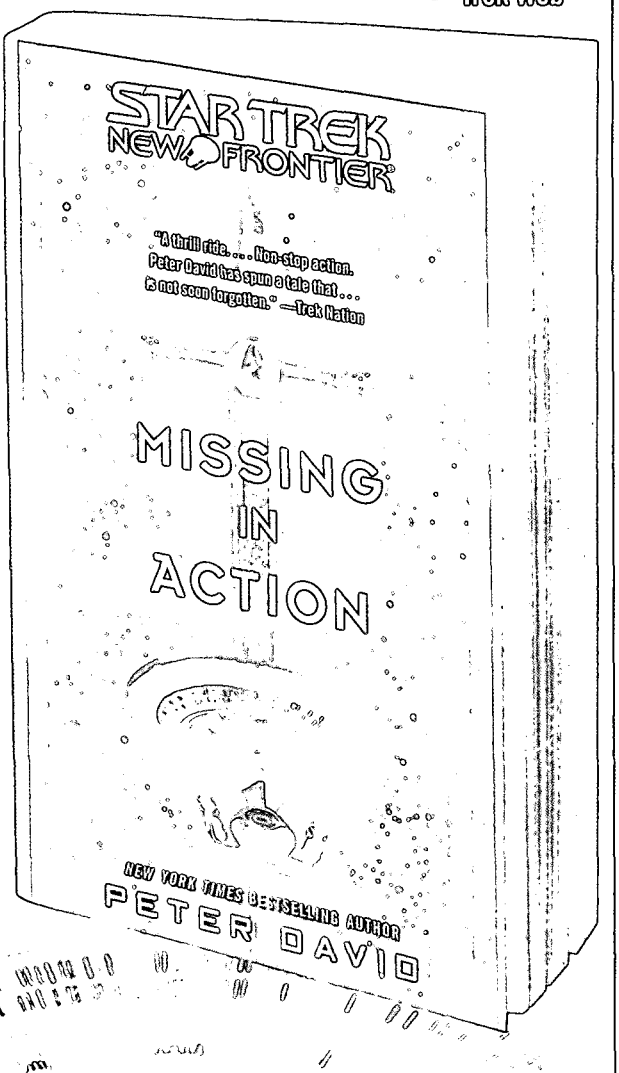
Now in paperback from the *New York Times* bestselling author

"A MUST READ."

—Trek Web

Captain Mackenzie Calhoun and the crew of the *U.S.S. Excalibur* find themselves trapped in another universe—where an ancient war rages between two powerful alien races.

"A THRILL RIDE... NON-STOP ACTION."
—Trek Nation


STAR TREK
NEW FRONTIER
"A thrill ride.... Non-stop action. Peter David has spun a tale that... is not soon forgotten." —Trek Nation
MISSING IN ACTION
NEW YORK TIMES BESTSELLING AUTHOR
PETER DAVID

STAR TREK NEW FRONTIER

Published by Pocket Books
A Division of Simon & Schuster
A CBS Company

www.simonsays.com
www.startrek.com

Also available as an eBook.

CBS Consumer Products

™, ®, & © 2007 CBS Studios Inc. STAR TREK and Related Marks are trademarks of CBS Studios Inc. CBS and the CBS EYE logo are trademarks of CBS Broadcasting Inc. All Rights Reserved.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Explore the Universe!

Visit www.analogsf.com
& www.asimovs.com
Home of the world's leading
Science Fiction magazines.

Log on and enjoy:

- ☆ Award-nominated stories from the genre's leading authors
- ☆ Readers' Forum
- ☆ Excerpts of current stories
- ☆ SF news and events
- ☆ Book reviews

ANALOG
SCIENCE FICTION AND FACT
www.analogsf.com

Asimov's
SCIENCE FICTION
www.asimovs.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED